VOL. I.

ABDOMINAL INJURIES
TO
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PREFACE TO THE FIRST EDITION.

When, recently, the first issue of the Monthly Cyclopædia of Practical Medicine, a journal published in connection with the present work, was placed before the profession, the changes which the Annual had undergone were described. Journals in pamphlet form being seldom preserved, it is deemed advisable to repeat in these pages the main reasons which have led to so important a step.

It was to adequately assist the general practitioner that the Annual of the Universal Medical Sciences was started. Just ten years ago the first series of five volumes appeared. What its life-history has been need hardly be told; that over five hundred thousand volumes have been distributed in the United States alone, sufficiently indicates the generous reception accorded it, while the encouragement given the editor, especially by his colleagues of the medical press, can but be recalled with emotion.

The last ten years, however, have been prolific in changes on every side. The intense activity displayed in all departments of medicine, the multiplicity of divisions and subdivisions in medical nomenclature, the ever-increasing value of time and the stringency of available pecuniary resources have greatly modified the circumstances surrounding a physician's existence and his needs. Although the Annual had become a much appreciated work of reference for authors and teachers, the general practitioner, for whom it had been especially created, failed to find in its columns the kind of assistance he required. Often disappointed because every disease, or subdivision of a disease,—pathology, treatment, etc.,—could not be reviewed each year, owing to the fact that the subjects had not received the attention of writers, he condemned the work *in toto*, overlooking the origin of the omission. Again, he found the work too voluminous for current reading,—the very mass of progressive work appalled him!

A careful analysis of the whole question revealed the underlying cause of trouble,—namely, that articles made up of heterogeneous excerpts fail to excite interest and, as a result, soon fatigue the intellect of the reader. Whenever a new line of thought is introduced, the subject modified by the new point adduced must be recalled and former propositions tending to transform both the older and the newer conceptions of the subject must be simultaneously considered and, as it were, digested. That the sum of intellectual labor required, if the progressive feature advanced is at all to prove profitable, must be arduous, is evident; that such labor gradually engenders a disinclination to utilize the kind of literature involving it is a conclusion which deductive reasoning can but sustain. Briefly, the Annual had made for itself a place

among writers, teachers, and investigators, but, for the reason given, it had not satisfactorily fulfilled its mission among family physicians, for whose benefit it had been especially planned.

Overworked, overburdened, and often poorly paid, general practitioners, especially those exercising their calling in country-districts, share but little in the enjoyments of life. Harassed, ever anxious, their moments of respite are but opportunities for Nature, and, in enforcing her rights, she subdues functional activity to insure recuperation. In her way, therefore, she prepares their powers for the morrow and thereby contributes her share to their beneficent labors. But, we have seen, scientific progress also has its claims, and the sufferer is entitled to the resources of medicine, not as they *were*, but as they *are*. The duty of the medical editor, therefore, lies between Nature's requirements as regards the physician, and the claims of justice as regards suffering humanity. Both, it was thought, could be subserved by presenting even scientific literature in an attractive, entertaining, easily-understood form, with professional dignity as a constant guide.

These general principles have formed the basis of a modified work, the first volume of which is now placed before the profession. Instead of presenting the excerpts from the year's literature arranged in order under a general head as before, each disease—including its subdivisions: "Etiology," "Pathology," "Treatment," etc.—is described *in extenso*, and the new features that the year has brought forth are inserted in their respective places in the text. In this manner the reader is saved all fatiguing study: he has before him what in the older work was left to his memory.

The work, when completed, will present all the general diseases described in text-books on practical subjects—medicine, surgery, therapeutics, obstetrics, etc.—and, inserted in their logical order in the text, all the progressive features of value presented during the last decade. This will remove the cause of dissatisfaction caused by the absence of general subjects in the older work. If the year brings forth nothing new upon any particular disease, the latter will, at least, appear as it was when last studied, whether this be one, two, five, or twenty years before. The general arrangement adopted will make it possible to cover the entire field in six volumes. As may be seen in any medical dictionary, the subjects treated in the first volume represent exactly one-sixth of the whole.

While the general practitioner's needs will thus be adequately provided for, authors and teachers will not have to deplore the change. Instead of having at their disposal only the reviews of a single year, as before, they will have those of practical value published during the last ten years. The article of "Abdominal Injuries," for instance, contains one hundred and sixty article excerpts besides the general text; that on "Appendicitis," a still larger number. Being interpolated in the text and controversially arranged, the abstracts either sustain the views advanced or indicate fields as yet insufficiently explored. This arrangement necessarily precludes chronological order; indeed, no attempt has been made to treat the various subjects historically, the aim being to give them an essentially practical form.

So great an amount of matter from different sources would seem to insure a degree of confusion tending greatly to increase the reader's labors. This is avoided by using large type for the general text—that is to say, the description of a disease—and small type for the excerpts from journals. Either may thus be read separately. If, for instance, the reader desires to merely review the general subject, he has but to read the text in large type; if he wishes to analyze or study a disease, operative procedure, drug, etc., in which he is particularly interested, he has but to include the small-type text in his perusal of the article.

So complete a rearrangement of the entire text could hardly be successfully carried into effect unless the editor could take part in the work of preparation. He therefore concluded that it would be best to have the majority of the sections prepared under his immediate supervision and to submit them to the members of the associate staff for revision and correction. Each editor enjoying the privilege of erasing, changing, or adding anything he chose, the correctness of the views presented was thus insured, while the innovations could be satisfactorily carried into effect. How carefully the associate editors have fulfilled their share of the labor can be judged from the character of the several articles bearing their names. The sections which have been prepared *in toto* by associates are those on "Addison's Disease," "Angina Pectoris," "Astigmatism," "Actinomycosis," "Anthrax," "Acetonuria," "Albuminuria," "Alcohol," "Antipyrine," "Atropine," "Belladonna," "Blepharitis," and "Bright's Disease." As may be seen, the members of the associate staff have again placed the editor under great obligation, and he wishes to express to them his deep gratitude. Drs. Witherstine and G. Archie Stockwell, of Philadelphia, and Dr. Arthur Turner, of Paris, have in other directions contributed to facilitate the editor's task and have placed him under many obligations.

The unsigned articles have not been submitted to associates. The more important ones, such as "Acetanilid," "Animal Extracts," etc., were written by the editor, while the others were prepared under his immediate supervision. The editor also selected the abstracts for all the articles; any error of judgment on that score must, therefore, be ascribed to him alone. Only the excerpts thought to convey practical information have been incorporated; but this feature of the work will be given further development.

The classification adopted is, to a certain degree, a novel one, general subjects alone appearing in the list. In other words, individual symptomatic manifestations, such as asthenopia, aphonia, bradycardia, etc., have not been given separate sections, but have been considered under the diseases of which they form part. This has made it possible to save considerable space, which has been utilized for the elaboration of subjects that are scantily considered in text-books, notwithstanding their great practical importance. "Abdominal Injuries," for instance, so frequent since electric tramways, foot-ball games, and bicycling have come upon the scene, have been given over forty pages, while the various phases of "Alcoholism"—doubtless the greatest scourge of the human race—have been considered in an equally exhaustive manner.

As to remedies, only those that are being generally utilized in a manner compatible with scientific precision and in accordance with professional ethics have been incorporated. The list includes a few new agents which seem to merit further trial. Obsolete remedies have not been mentioned, the aim being to present those which constitute a modern physician's armamentarium. Again, only the diseases in which the remedies mentioned are of special value have been alluded to, along with what new points the recent literature may have afforded.

To facilitate the use of the work, the subjects have been arranged in alphabetical order, the references being given in full at the end of each abstract. The index and reference list, which occupied so much room in the older work, could thus be dispensed with.

The personal commentations contributed during the last ten years by the associate editors have been introduced when applicable, and many illustrious names—some of which recall departed friends, such as D. Hayes Agnew, Benjamin Ward Richardson, Dujardin-Beaumetz, J. Lewis Smith, Joseph O'Dwyer, and others—are thus perpetuated in the pages of the work.

In the 1896 issue of the ANNUAL the following statement was made: "The hard-worked practitioner is the protector of a correspondingly great number of human lives; to help him, therefore, in acquiring practical knowledge is to increase his fighting force,—*i.e.*, to help him in the accomplishment of his duty—a higher one than any other allotted to man." These words can be repeated to-day; they represent the foundation of the new ANNUAL AND ANALYTICAL CYCLOPÆDIA OF PRACTICAL MEDICINE, which the editor respectfully dedicates to the American Medical Profession as an expression of profound devotion.

THE EDITOR.

2043 WALNUT STREET,
PHILADELPHIA, MARCH 1, 1898.

SAJOUS'S ANNUAL

AND

ANALYTICAL CYCLOPÆDIA OF PRACTICAL MEDICINE.

A

ABDOMEN, INJURIES OF THE.

Contusion.

Symptoms. — The symptoms attending a contusion of the abdomen, whether caused by blows, kicks, spent bullets, the passage of heavy bodies—such as vehicles—over the abdomen, etc., are not always such as to call attention to the seriousness of the lesion present. The gravest abdominal injuries may co-exist with practically no external or general indication of mischief, the patient walking a long distance, perhaps, without experiencing anything more than slight local pain where the blow had been received.

Case of a boy who, after he had received a blow over the abdomen, walked a mile with but little assistance. Death occurred thirteen hours later. At the post-mortem the duodenum was found completely torn across. Thomas Bryant (Lancet, Nov. 2, '95).

Case of a man who, after a fall, was able to walk to the hospital notwithstanding the fact that the intestinal contents were in the peritoneal sac, that perforation of ileum existed, besides complete division of the jejunum. Lambret (Le Bull. Méd., Feb. 10, '95).

Literature of '96-'97-'98.

In the army a large number of the men kicked in the abdomen by horses, and in whom the injuries soon prove fatal, show no sign of shock or other symptoms. They often continue their work or their drill on horseback until ordered to the hospital by their superiors. Editorial (La Méd. Mod., Feb. 15, '96).

Case of ruptured duodenum followed by death in sixteen hours. No visible bruise or external wound was present when the patient had been taken home, and, after the application of hot flannels, he had so far recovered that he was able to get about for some hours, and walked upstairs and downstairs. It had been difficult, at first, to persuade his parents that he was in imminent danger of death. Napier Close (Lancet, July 17, '97).

The abdominal walls may be but slightly injured; but, again, the lesions may consist of extensive extravasations of blood between the layers, or sufficient laceration of the muscular and other tissues to give rise to more or less local sloughing. Such lesions of the abdominal wall, however, are not always accompanied by injury of the abdominal organs.

Case of severe crush, rupture of the right rectus and flat muscles at the umbilical level, and very general subperitoneal hæmorrhage demonstrated by laparotomy, the intestine, however, being uninjured. Recovery. Bloodgood, Fin-

ney, and Halsted (Johns Hopkins Hosp. Bull., Mar., '94).

A trifling superficial injury of the abdominal wall may be associated with serious internal lesions, owing to the resistance offered by the abdominal walls and the fragility of the abdominal organs. The external appearances, therefore, should not be taken as a criterion.

Case in which there were but trivial marks of violence on the surface of the body, the result of an elevator-crush. The autopsy showed that the liver, spleen, and the right kidney had been lacerated.

In two soldiers wounded at the siege of Sebastopol the clothing and abdominal walls showed no signs of injury, and still the liver and spleen of both men were found reduced to a pulp and the intestines extensively lacerated. Hulke (London Lancet, Dec. 31, '92).

Literature of '96-'97-'98.

Narrow bodies, the action of which is exerted on a small area, reach more deeply by overcoming resistance of the abdominal parieties more easily than larger bodies. Resistance varies with the age, state of obesity, and state of relaxation or contraction of the muscles. The direction of the blow is of importance. If perpendicular to the deeper structures, it is most harmful; when parallel, it tends to glide off; when oblique, the force is modified. Demons (Brit. Med. Jour., Nov. 27, '97).

Case of young man riding bicycle when he was struck in upper part of abdomen by end-pole of an express-cart coming in opposite direction. He was thrown from wheel, but recovered himself soon. Only symptom slight pain and tenderness at seat of injury. Three hours later general abdominal pain and tenderness, steadily increasing. Temperature rose quickly five hours after injury. Abdomen was opened: in first eight inches of small intestine drawn out of wound two rents encountered, the larger was complete and involved half-circumference of gut. Smaller one partial, involving peritoneal covering and part of muscular coat only. Beginning peritonitis present. No extravasation of intestinal contents. No evidence of hæmorrhage of importance. Five inches of intestine, including in it both rents resected, and bowel sutured. Recovery complete on twenty-fourth day. Francis S. Watson (Boston Med. and Surg. Jour., Feb. 10, '98).

Case of child that, falling from a wagon and striking her abdomen on a brick, died eighteen hours afterward. Symptoms of internal injury developed with astounding rapidity, and, though there were no signs of injury to superficial structures, there was found at operation performed fifteen hours after accident perforation of intestines and strangulation of three feet of bowel, which passed through a loop of mesentery. H. N. Chapman (N. Y. Med. Jour., Nov. 26, '98).

In the majority of cases, however, severe contusions of the abdominal wall, whether the deep organs are involved or not, are followed by agonizing pain in the region of the injury, restlessness, nausea or vomiting, marked prostration (indicated by a small, rapid, and irregular pulse), pallor (sometimes attaining lividity), cold sweats, rigidity of the abdominal wall, meteorism, anxiety, and fear of a fatal issue.

All these symptoms bear the imprint of a severe nervous commotion, and, if the extensive distribution of the sympathetic nervous system in the abdominal cavity is borne in mind, the fact will become evident that symptoms usually witnessed immediately after the receipt of the injury are due mainly to the influence of the concussion upon the sympathetic supply. Sudden death has been known to follow a violent blow, especially when received in the region of the solar plexus.

The pain varies according to the location of the traumatism and the sensitiveness of the patient. Very severe at first,

it usually becomes less marked after a few hours. It is greatly influenced by shock, profound prostration reducing its intensity by reducing sensation. Great restlessness usually accompanies abdominal pain after injuries, as well as during other diseases, such as appendicitis, when the suffering is due to a localized trouble. The pain may be radiated in various directions,—the shoulder, the umbilicus, the left axilla, the testicles, etc.,—according to the site of the primary lesion. Local tenderness is usually marked over the site of the traumatism.

The vomiting varies greatly in intensity from mere nausea to the most violent expulsive efforts, which are liable, by the strain upon the abdominal organs, to suddenly increase the extent of the lesions. The vomited matter sometimes contains blood, especially if the upper portion of the digestive tract is involved in the injury. Constant and persistent vomiting tends to indicate a contusion accompanied by visceral lesions.

In simple cases the vomiting is repeated but two or three times. When the intestine is ruptured the vomiting is persistent and intractable and liver-dullness is absent. Berndt (Deutsche Zeit. f. Chir., vol. xxxix, p. 516).

The degree of shock depends upon the nature and extent of the injury and especially upon the amount of blood lost. When the signs of collapse gradually become more marked, internal hæmorrhage from rupture of one or more of the viscera is to be feared.

The pulse, usually rapid and weak at first, gradually becomes stronger and slower if a favorable reaction is about to take place. If, on the contrary, an unfavorable course is being taken and some complication is to occur, its rapidity and tension may become increased. Irregularity is not a favorable indication if it persists.

The temperature is independent of the pulse, except when a favorable reaction is taking place, when it may return to the normal line after having gone beyond or below it. The usual belief that a subnormal temperature always follows internal hæmorrhage is fallacious; for it may also be raised. The temperature, therefore, is of no value as a guide.

It is generally believed that subnormal temperature is always present when there is intraperitoneal hæmorrhage. Cases showing that there may be, on the contrary, a marked elevation of temperature. Reynier and Quénu (Soc. de Chir., Dec., '95).

Case in which there was elevation of temperature of 2° F. five hours after the accident. Perforation of duodenum found. Darde (Arch. de Méd. Milit., Apr., '95).

Literature of '96-'97-'98.

Case in which there was an elevation of temperature of 3½° F. five hours after receipt of injury. Vautrin (La Méd. Mod., Feb. 15, '96).

Hæmatemesis may assist in establishing the diagnosis of lesion in the stomach or the upper portion of the intestinal tract, while the presence of blood in the stools may do the same as regards lesions of the intestines as a whole, including the colon. But, in itself, this symptom is, by no means, characteristic, since a violent strain may cause sudden engorgement of pharyngeal, gastric, rectal, or hæmorrhoidal vessels and then, several days after the accident, blood-rupture ensue. Even when present, streaks in vomited matter or stools are not always indicative of an alarming condition.

Case in which blood-streaked stools appeared on the fourth day after a

severe blow. No aggravation of other symptoms. Uninterrupted recovery. Augarde (Thèse de Lyon, '95).

Blood in the urine is a more reliable sign of lesion in the urinary tract, especially the kidney and bladder. Anuria is also indicative of lesions in these organs; but, as shock frequently arrests the flow of urine, it is only valuable as a symptom after all symptoms of shock have passed.

Hæmorrhage into the orbits and from the ears are occasionally met with when the concussion has been very severe. This symptom does not necessarily indicate that the injury is an unusually dangerous one.

Case in which violent crushing of the abdomen, not followed by visceral lesions, produced hæmorrhage into the orbits, the blood-vessels having doubtless ruptured from their overdistension brought about by the abdominal pressure. Orbital hæmorrhage seen before in a case of crushed thorax, but with it there was also bleeding from both ears; recovery likewise took place in that case. Thomas Bryant (London Lancet, Dec. 7, '95).

A few hours after the accident the pain usually becomes reduced; the patient may be more quiet and, perhaps, somnolent, although the pulse remains in its former condition. This period lasts between twelve and twenty-four hours. If at the end of this time there be no complication, a visceral lesion is probably not present. If, on the contrary, the symptoms gradually increase in intensity the likelihood of grave injury is very great.

In the light of present knowledge, however, the practitioner should not delay active procedures until the patient's life becomes compromised by permitting the mechanical injury produced to start an infectious process, when the manner in which the injury was inflicted and the force applied tend to suggest serious internal lesion.

Diagnosis.—The diagnosis should primarily be based upon the history of the accident, the manner in which the injury occurred, the shape of the body, or bodies, by means of which the traumatism was inflicted, and the degree of percussive force applied, and, secondarily, upon the symptoms present.

Lesions of the Intestinal Tract.—Various theories have been advanced as to the manner in which rupture of the intestine is brought about, but experiments have shown that squeezing of the gut between the compressed abdominal wall and the vertebral column is the main mechanical factor brought into action. Crushing against the ilium is rarely produced. Another, although rare, cause of rupture is the presence, in the intestinal tract, of liquid or semiliquid material, the sudden circumscribed pressure exerted upon the gut causing it to burst, through overdistension. The small intestine is the seat of lesion in 75 per cent. of the cases of rupture in the course of the intestinal canal. Hence the importance of carefully ascertaining in each case the direction from which the percussive force came, the intensity of that force, and the relative position of the organs between the site of pressure and the spinal column.

The character of the force and the mode of its application always appear to be of much value as a help to diagnosis in most cases of intestinal injury, for it would seem that where the force is of diffused rather than of a localized character the injury is more likely to be extensive or even double. Thus, when a human being is run over, the wheel of a vehicle passing either over the abdomen or the back with the abdomen downward; when he falls from a height upon a plank or beam; is trodden on by

a horse; or is crushed between two obtuse bodies, it is most probable that either a solid viscus has been lacerated or that some portion of the small intestine has been torn in one or more places. Thomas Bryant (London Lancet, Dec. 7, '95).

Literature of '96-'97-'98.

Seven cases of severe contusions of the abdomen, with intestinal perforation. The seat of perforation is, in the majority of cases, in the small intestine, and successively in order of frequency come large intestine, stomach, and duodenum. Physical signs are tympany in the epigastrium and an area of dullness in the lower portion of the bowel. Adolph Schmitt (Münch. med. Woch., July 12, '98).

Another factor of importance in establishing a diagnosis is the size of the instrument causing the injury. Lesions of the digestive canal, for instance, are usually the result of violent and sudden percussion produced by a body over a limited surface of the abdominal wall.

Statistics of 149 cases in which various degrees of rupture in the intestinal tract had occurred. In 80 of these, in which the history was clearly given, 36 cases were due to horse-kicks, 23 to carriage-wheels, 13 to kicks from men, and 8 from spent shell-fragments or bullets. Chavasse (French Cong. of Surg., '85).

The predisposing factors are the presence of solid, semisolid, or fluid matter in the hollow viscera; leanness of the individual, and intestinal adhesions.

Any of the above accidental causes of injury being fulfilled, rupture of some portion of the gastro-intestinal tract is likely, especially if there is loss of consciousness at the time of the accident, followed by collapse, severe pain, a rapid and weak pulse, vomiting, tympanites due to the escape of intestinal gas into the abdominal cavity, and tenderness and rigidity of the abdominal walls. Such a diagnosis is further strengthened by hæmatemesis or bloody stools, the former tending to indicate a lesion of the stomach. Death occurs in 96 per cent. of such cases if unoperated.

Two signs which enable the physician to diagnose the occurrence of intestinal perforation before peritonitis has had time to manifest itself: first, distinctness of the murmurs of the heart and respiration during auscultation of the abdomen,—due to the presence of intestinal gases in the peritoneal cavity. Second, change in the pulse, which, at the moment of perforation, becomes accelerated, to slacken some hours later,—due to the absorption of putrid gases acting as cardiac poison. Gluzinski (Sem. Méd., Nov. 6, '95).

Literature of '96-'97-'98.

A ruptured intestine is probably present, though this is not certain, when, after a diffuse injury to the abdomen or a severe local injury as the immediate result of the accident, there is little collapse, and where vomiting soon becomes a prominent and persistent symptom, with lasting local pain and great thirst, with or without abdominal enlargement. Nineteen cases of rupture of the intestine adduced confirm the truth of this statement. Bryant (London Lancet, Jan. 11, '96).

After contusions and wounds of abdomen contraction of the muscles of abdominal wall indicates certainly visceral lesions. Out of ten cases of serious contusion it was present seven times, and surgical intervention resulted in the discovery in each case of grave visceral lesions. M. Hartmann (Journ. des Prat., Oct. 29, '98).

Contraction of muscles of abdominal wall observed many times in cases of grave abdominal contusion occasioned by the kick of a horse. Operation not performed, and patients recovered. Necessity of emergency laparotomy recognized in these cases, but only when there exists a pathognomonic group of visceral lesions pointing to intestinal complica-

tion. Delorme (Jour. des Prat., Oct. 29, '98).

Lesions of the Stomach.—Blows seldom cause rupture of the stomach, the elasticity of the organ, even when containing liquid or semiliquid material, being such as to cause it to escape injury under sudden impact or great pressure. It is also protected by the lower ribs, the liver, and the intestines. Nevertheless, this organ is occasionally involved in traumatism affecting other abdominal viscera. In the majority of cases the rent is found near the pyloric orifice, but the greater curvature may be the seat of the lesion, while the entire organ is occasionally torn from end to end. In the latter case, however, death ensues almost immediately in practically all cases. Pressure during lavage of the stomach may also cause laceration of the mucous membrane.

Case of a man who died in coma after several washings of the stomach for opium poisoning. At the necropsy several rents of the mucosa were found. Conclusion that the presence of the fluid was the cause of the injury, by pressure. Key-Aberg (Deutsche med. Zeit., Apr. 28, '92).

In the case of incomplete tears there may be hæmatemesis and severe localized pain resembling that of gastric ulcer,—gnawing and burning in character. This is followed by localized inflammation with tendency to the formation of adhesions. Hæmorrhage between the coats of the stomach may also occur in incomplete tears, a cyst-like pocket being formed.

Case of traumatic lesion of stomach with injury to the left lung and kidney. The hæmoptysis and hæmaturia subsided in three weeks, when a fluctuating, pulsating tumor was discovered under the left costal margin. Four weeks afterward laparotomy performed, and three quarts of non-coagulable, bloody fluid drawn from a cyst between the coats of the stomach. Ziegler (Cent. f. Chir., Apr. 21, '94).

Violent pressure upon the stomach may cause it to be crushed against the spinal column, and the mucous surfaces be lacerated by interpressure of the anterior and posterior walls of the organ. In such a case a marked lesion necessarily follows, giving rise to copious hæmatemesis.

Case of a boy who was caught between two freight-cars. Shock and vomiting of blood, but no external injury. Twelve hours after the accident the abdomen opened and a slight laceration in the spleen sutured. No other injury found. The autopsy showed two ruptures of the mucous membrane of the stomach,—one of the anterior wall about its middle and the other opposite to it in the posterior wall, the mucous membrane alone being stripped from the muscular layers. J. H. Clayton (Brit. Med. Jour., Mar. 24, '94).

The presence of rupture of the stomach can be ascertained by inflating the organ with hydrogen-gas through an elastic stomach-tube. If the organ be dilated by this procedure, penetration beyond the mucous coat is improbable. If the stomach cannot be distended, complete rupture has taken place; and tympanites, due to the presence of the gas in the cavity proper, will be recognized.

Rupture of the stomach implicates the peritoneal coat in the majority of cases, the elasticity of the peritoneal investment being less than that of the two internal coats,—muscular and mucous. The contents of the stomach, or a portion of them, escape into the peritoneal cavity and cause severe suffering and shock, followed promptly by death or septic peritonitis.

Lesions of the Liver.—The liver, owing to its friable nature, its size, and its ana-

tomical position, is the organ most frequently injured, because indirect concussion may cause a profound lesion. A fall from a great height into water may thus cause a gaping rent of the capsule and parenchyma and open a large number of vessels. Severe and sudden blows of any kind, especially those involving much surface, over the abdominal wall may thus cause injury to this organ. Again, its softness, which may be increased by hypertrophy, causes it to yield readily to the crushing produced by carriage-wheels, car-bumpers, etc.

The severity of all the general symptoms is usually increased. The pain, when the liver is seriously injured, is peculiar; it radiates from the right hypochondrium to the waist, the scrobiculus cordis, or the scapular region. The respiration is generally embarrassed; there is marked shock. Examination of the fæces may show the absence of bile, especially if the bile-duct is ruptured, an occasional complication. The dissemination of bile in the system causes itching and, after a time, jaundice. The escape of bile into the peritoneal cavity may not give rise to peritonitis, however, this fluid being aseptic. A serous exudate may result from the irritation caused by its presence, forming a composite fluid which may be retained in the peritoneal cavity a considerable time.

Case in which, after severe contusion in the hepatic region, swelling, with considerable rise of temperature, supervened. Incision in the median line. A cavity, from which about a quart of reddish fluid issued, found. Recovery. Lyonnet and Jaboulay (Lyon Méd., No. 10, '95).

Case of rupture of the liver in which there was copious exudation into the abdominal cavity. Urine containing bile; stools ash-gray. Seven quarts of dark mahogany-colored fluid withdrawn, and found to contain much biliary pigment, especially biliverdin. Recovery. Roux (Le Bull. Méd., Dec. 8, '95).

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Case of rupture of the liver with operation and recovery. The kick caused a rupture of the liver on its upper (diaphragmatic) surface; through this rupture bile and blood slowly effused, but they were shut off from the peritoneum by adhesions, which developed rapidly before the effusion had become great in amount. The wound on the surface of the liver healed, but a cavity was left in the substance of the organ into which the torn bile-ducts poured their contents. Some of the bile that had escaped through the tear in the surface of the liver found its way through the diaphragm into the right pleura and gave rise to a pleurisy with effusion. There were thus three separate collections of fluid: (1) In the right pleura. (2) In a space formed between the diaphragm, the convex surface of the liver, and the anterior abdominal wall. This commenced to form immediately after the accident, and probably did not increase in amount after the first twenty-four hours. (3) In a cavity within the liver. This last collection, no doubt, went on slowly increasing until it was evacuated. W. Moore (Lancet, Sept. 18, '97).

A rent is probable after a severe injury if there is collapse, if the pulse becomes more rapid and small, if the patient shows signs of exsanguinity, if the area of liver-dullness on percussion is increased, and if pain radiating to the scapular region is complained of. Severe injury may exist, however, without these indications.

Diagnosis of rupture of the liver is rendered difficult by the fact that the local symptoms do not arise till late, while the danger is greatest during the first twenty-four hours. Zeidler (Deutsche med. Woch., Sept. 13, '94).

Case of a boy, aged 16, run over by a cart which had passed over his abdomen. The boy walked a quarter of a

mile to the hospital. When admitted he was pale and in great pain, but his pulse was full; no external signs of injury. On the fifth day he had an action, accompanied with severe abdominal pain, speedily followed by collapse and sudden death. Fissure three inches deep was found in the right lobe of his liver. Thomas Bryant (Lancet, Nov. 2, '95).

Lesions of the Gall-bladder or Biliary Ducts.—Blows and other conditions capable of causing hepatic rents sometimes implicate these organs in the lesion. There may be severe pain in the right hypochondrium if a rupture exists, vomiting of food and bile, and icterus. The urine is usually dark-mahogany and the stools ash-gray in color. Tenderness over the hepatic region is usually marked. The intensity of the symptoms depend to a degree upon the quantity of bile voided into the abdominal cavity; but, this secretion being aseptic, peritonitis only occurs as a complication when the peritoneum is itself implicated in the traumatism, or when the lesion is at the junction of the biliary tract and the intestinal canal, the latter in that case acting as a source of infection.

Case of a man who, after a severe blow in the right hypochondrium from the shaft of a cart, showed all the symptoms of rupture in the biliary tract. Seven quarts of a dark-brown liquid, rich in biliary pigments, biliverdin, etc., withdrawn on the fourth day by paracentesis. Prompt recovery. Jules Roux (Marseille-med., Aug. 25, '95).

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Case of rupture of the gall-bladder by contusion. Inflammation developed slowly and death resulted in three days. Post-mortem showed the patient had a large gall-bladder with numerous gall-stones. If an operation had been made early the chances would have been favorable. McLaren (Journal Amer. Med. Assoc., July 9, '98).

Case in which rupture of gall-bladder occurred in boy, aged 9 years, who was run over by a heavy cart. Distension of abdomen followed, and, though no jaundice was present, stools were clay-colored. On opening the abdomen large quantity of bile-stained fluid was found free in peritoneal cavity; five pints of this fluid were evacuated and drainage-tube inserted. Complete recovery followed. M. H. Martin (Lancet, Dec. 31, '98).

Lesions of the Spleen.—The causes of injury to this organ are the same as those of the liver. Rents, sanguineous infiltration, and partial crushing are the lesions most frequently observed. Enlargement of this organ through a malarial cachexia renders it susceptible to lesions which traumatism would not give rise to were it in its normal state.

In extensive lesions copious hæmorrhage usually takes place and death rapidly follows. If the lesion present is less severe, however, and the hæmorrhage be moderate, there is tendency to collapse, increasing pallor, and a feeling of suffocation. The latter symptom and severe radiating pain in the region of the spleen are generally present, besides the signs peculiar to all abdominal injuries. If the patient survives sufficiently long the immediate effects of the traumatism, peritonitis or abscess and other complications frequently result. Severe local pain generally continues for some time, and chills are not infrequent. Percussion shows the organ to be more or less enlarged.

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Case of young man who fell from his horse and was struck on left side of thorax low down in the axillary line by animal's hind hoof. Brought to hospital in state of shock. Patient complained of considerable pain over left side of the lower ribs, rather toward the back. Infusion of 1200 centimetres of sterile salt solution given. Next day symptoms of internal injury were apparent. Opera-

tion. The peritoneum purplish in color, bulged forward, and peritoneal cavity completely filled with blood-clots and fluid blood. Rupture of spleen found. Spleen removed, together with blood-clots in peritoneal cavity. At this stage of operation patient was in a moribund condition. Vein in arm was opened, and saline infusion of 2000 centimetres given. Recovery uneventful. Charles McBurney (Med. Rec., Apr. 23, '98).

Four successful cases of splenectomy for rupture without external wound. Diagnosis of ruptured spleen is arrived at from (1) the locality of the injury; (2) the evidence of internal hæmorrhage, and (3) the large fixed dullness in the left flank. Ballance (Practitioner, Apr., '98).

Difficulties of diagnosis in rupture of the spleen well shown in following case. Patient had been struck violently over left lumbar region and was picked up in state of profound shock. He recovered temporarily, but after a second accident his condition became such as to indicate removal of appendix. This was followed by temporary improvement. An abscess developed, in a few weeks' time, at middle of anterior border of right lumbar muscle. This was opened and explored, and a tract leading to the region of left kidney discovered. Drainage of tract afforded temporary relief, but chills and fever redeveloped and a fourth operation was performed. The patient finally died from heart-failure and the necropsy revealed a ruptured and necrosed spleen. J. Riddle Goffe (Med. News, Dec. 24, '98).

Lesions of the Kidneys.—The kidney is firmly held in place by its attachments, while its consistence is such as to preclude elasticity. Hence, a blow or undue pressure may cause rupture. All the causes of injury that may take part in the production of lesions elsewhere may also induce renal lesions, which may consist of contusion, rupture, or laceration.

Thirty-six cases of renal lesions of traumatic origin. An abundant hæmorrhage may take place without any rupture from tearing of the vascular network surrounding the organ, and which sometimes becomes engorged. Güterbock (La Semaine Méd., July 3, '95).

Literature of '96-'97-'98.

Hæmaturia is valuable only as showing the fact of rupture of the kidney, but not as a symptom by which to decide on operating. It is not the visible loss of blood by the bladder, but the easily overlooked, but far more dangerous, bleeding into the perinephric tissues, or into the peritoneal cavity, that should receive the chief attention. W. W. Keen (Annals of Surg., Aug., '96).

Besides the symptoms common to severe abdominal traumatism there may be increased pain in the lumbar region with radiations in the direction of the pubis and rigidity of the muscles. Dullness on percussion is sometimes elicited. Anuria may also occur, but this is not a characteristic sign. Hæmaturia is an important indication of renal laceration, however, although it may not present itself at once; it may be followed by the appearance of pus. The catheter should be used in these. Retraction of the testicles is also said to occur (Rayer). The ureter is very rarely involved; when it is, the symptoms are not modified. Enlargement of the lumbar and hypochondriac regions is present in the majority of severe cases, but may supervene late in the history of the case.

Case under careful observation for three weeks from the hour of his accident and another five weeks before developing any sign of kidney laceration. After that time a swelling appeared in the loin, due to extravasation of blood or urine into the perirenal tissues. Henry Morris (Clin. Jour., Aug. 1, '94).

Thanks to the compensatory work of the uninjured kidney, the mortality of renal lesions is not so marked as when other abdominal organs are injured.

Statistics of 120 cases, showing 53 recoveries and 67 deaths, a mortality of

53.7 per cent. Reckzy (Wiener klin. Woch., Nov. 8, '88).

Even severe wounds have been known to heal. If large renal vessels are torn, marked lividity occurs, the patient rapidly becoming exsanguine. Death may thus follow very soon. Involvement of the peritoneum in the injury is promptly followed by peritonitis, the signs of this affection appearing a few hours after the receipt of the injury. Sepsis is not an infrequent complication in unoperated cases.

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Statistic of 118 cases published since 1878, 50 of which were fatal. In 14 of these the fatal result was due to primary, continuous, and secondary hæmorrhages combined with shock, while suppuration, including peritonitis, caused death in 16 cases. W. W. Keen (Annals of Surg., Aug., '96).

Case of boy run over by heavy wagon, resulting in fracture of right lower ribs; symptoms of internal hæmorrhage pointed to right kidney. When abdomen was opened, spleen had been completely severed from remainder of organ and forced to right side of abdomen. Right kidney was so badly crushed that it had to be removed. Remnant of spleen removed. Boy died in twenty-four hours. At autopsy it was found that left kidney had been torn completely through. Robert Abbe (Med. Record, Apr. 23, '98).

Prognosis.—Death almost invariably attended rupture of the intestinal tract prior to the introduction of exploratory abdominal section and prompt resort to active surgical procedures when necessary, is indicated.

Chavasse has collected thirty-six cases of kicks in the abdomen by horses, thirty-five of which died. A man who has been kicked in the abdomen by a horse has one chance out of three of dying. More than one-half of personal cases saved, thanks to intervention, although it is true that some cases were opened which might have recovered spontaneously. The laparotomy did no harm. Intervention should be practiced when there are sharp, local pains and rapid elevation of temperature. Kirmisson (La France Méd., No. 14, '95).

Literature of '96-'97-'98.

Three hundred and seven cases of contusions of the abdomen, from the kick of a horse, treated without operation, found in literature; 215 recovered and 92 died. Of 36 cases in which operation was practiced, 26 died and 12 recovered, and in only 3 of these could operation have been considered as imperatively necessary. As soon as a patient is kicked in the abdomen by a horse, he should be taken to a hospital, a careful history of the accident taken down, and the patient treated expectantly. He should be placed in bed, heat applied, pain relieved, and should be given no food; every half-hour the temperature and respiration should be recorded, with a note of the general condition and the local symptoms. The moment that peritoneal reaction or general infection is evident the abdomen should be opened. Seven cases personally witnessed in which recovery occurred without operation. Nimier (Arch. de Méd. et de Pharm. Mil., Mar., '98).

Where abdominal contents are ruptured 96 per cent. of cases die. Early operation favored. John T. Rogers (Jour. Amer. Med. Assoc., July 9, '98).

The mortality following the expectant plan of treating possible perforation of intestines (97.5 per cent.) condemns this mode of treatment; especially if it be compared with that of cases operated upon within the first twenty-four hours (45 per cent.) or even that following operations after twenty-four hours have elapsed (66.6 per cent.). It is the surgeon's duty in great majority of abdominal contusions, attended with serious symptoms, with rapid onset, to at once explore the abdominal cavity. Adolf Schmitt (Münch. med. Woch., July 19, '98).

As to the liver, as late as 1864 wounds of this organ were considered as practically hopeless in every instance. While a very small proportion of these cases recover without surgical interference, as is shown by the scars occasionally found in the hepatic parenchyma, the fact remains that an exploratory laparotomy, permitting the surgeon to quickly arrest the loss of blood in case of hæmorrhage and to rid the peritoneal cavity of accumulated extraneous fluids, has greatly reduced the mortality. The prognosis becomes much more unfavorable when peritonitis has set in, but a fatal issue may sometimes be averted, even in advanced cases of this complication, by surgical intervention.

Case in a girl, aged 9, who, four days after receiving a kick, came under treatment, with well-marked peritonitis. On the fifty-second day abdominal section; adhesions found everywhere. Nevertheless almost steady recovery. A year afterward the child seen and in perfect health. Greiffenhagen (St. Petersburg med. Woch., Apr. 25, '92).

The same remarks apply to rupture of the gall-bladder.

Case of rupture of the gall-bladder due to a blow upon the abdomen. Three weeks after the accident laparotomy was performed with the removal of three quarts of brownish fluid containing numerous blood-clots. Convalescence slow, but complete. Thomas (Deutsche med. Woch., July 14, '92).

Slight contusions of spleen heal readily, but rents and tears of any importance are frequently followed by fatal hæmorrhage. Abscesses occasionally complicate convalescence.

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Case of V-para of 31 in sixth month of pregnancy. Drunken man had trodden on left side of her abdomen; on following day there were signs of internal hæmorrhage. Laparotomy disclosed rupture of spleen as source of bleeding. Spleen extirpated and the woman made excellent recovery and was spontaneously delivered of a healthy child at full term. Tabulated eight reported cases of removal of spleen for injury, five recoveries. Savor (Centralb. f. Gyn., 1305, '98).

The great majority of cases of rupture of the kidney that recover are those in which the initial lesion had been comparatively slight. In the graver cases, in which there is copious hæmorrhage into the perinephric tissues or into the peritoneal cavity, of which the growing exsanguinity of the patient is an indication, the prognosis depends upon the speed with which adequate surgical procedures are instituted. Occasionally, however, the blood is held in check by the renal capsule.

Case of rupture of the left kidney in a Hindoo boy, aged 16 years, who fell over the lower piece of a door-frame. He immediately fainted, remaining unconscious for two or three minutes. An hour later he passed bloody urine, and continued to do so until he entered the hospital, ten days later. Large swelling on the left side of the abdomen, reaching as far as the umbilicus in the middle, the lumbar spine on the back, and the crest of the ilium downward, painful on pressure. Under turpentine the urine became clear for a week; later the urine became again bloody, and the size of the tumor increased. Laparotomy. The hæmatoma seemed to be formed by the capsule of the kidney. At the end of seven weeks the patient discharged cured. Chuckerbutty (Indian Med. Gaz., July, '88).

The prognosis depends greatly, therefore, upon the patient's ability to stand operative procedures suitable to establish a positive diagnosis and bring the lesion that may at any moment destroy life within the immediate reach of art's highest powers. When serious injury is

rendered probable by the nature of the accident, and the symptoms present also indicate a serious lesion, an exploratory incision, if the patient is not past relief, a careful examination of the organs involved, arrest of hæmorrhage, closure of the disrupted tissues, or cleansing of the abdominal cavity may save him even when his condition appears almost hopeless.

Again, the prognosis is influenced by the time elapsing between the accident and the institution of surgical procedures. The sooner they are resorted to, all things considered, the greater the chances of success.

Literature of '96-'97-'98.

Laparotomy, to prove successful, must be undertaken early,—that is, not later than twenty-four hours after the receipt of the injury, and earlier if possible,—for it seems that death within thirty-six or forty-eight hours of the accident is the rule. Thomas Bryant (Lancet, Jan. 11, '96).

No case can be considered as hopeless unless a subnormal temperature, cold and cyanosed extremities, and other signs indicate that the end is near.

In cases of severe abdominal contusion in which there are good grounds for suspecting visceral injury there are only two contra-indications forbidding prompt surgical treatment: intense nervous shock immediately following the injury, and at a later stage, when the patient, suffering from extensive and advanced peritonitis, is cold and cyanosed and in a state of extreme collapse. Sieur (Archiv. Gén. de Méd., July, '93).

Literature of '96-'97-'98.

A case may be considered as inoperable when there is profound collapse, the tongue being cold, the extremities cyanosed with an imperceptible pulse, and a temperature anging from 96° to 97° F. Editorial (La Méd. Mod., Feb. 15, '96).

Even when performed late in the history of the case, the operative measures sometimes prove successful.

Successful case of laparotomy and vesical suture for intraperitoneal rupture, the operation being undertaken fifty hours after the accident, the longest time noted in a successful case, excepting the case reported by Knight, with a fifty-four hours' interval. H. Schramm (Wiener med. Woch., Aug. 16, '90).

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Case in which blow on abdomen caused rupture of pancreas followed by rapid formation of larger pancreatic cyst simulating closely an abdominal aneurism. Four weeks after injury cyst evacuated through the abdominal incision and drained. Critical condition of patient contra-indicated attempt to suture wound in pancreas. On third day following operation subphrenic abscess was evacuated through a bronchus and patient rapidly recovered. There was profuse discharge of pancreatic fluid from abdominal wound. The cyst contracted to small sinus, which healed on seventy-seventh day after operation. Patient fifteen months after injury was well and showed no functional disturbance of any alimentary process. H. W. Cushing (Jour. Amer. Med. Assoc., Mar. 7, '98).

The early recognition of a rupture of the bladder greatly influences the prognosis. About 60 per cent. of the most unpromising lesion, intraperitoneal laceration, are saved by prompt surgical measures. The remaining 40 per cent. are unsuccessful mainly on account of delay in resorting to abdominal section. A successful result has, nevertheless, followed laparotomy as much as fifty-four hours after the rupture.

Reviews of the literature of 32 cases collected, 22 of which are intra- and 10 extra- peritoneal. Of the intraperitoneal cases 10 recovered. Of the extraperitoneal ones 7 recovered. Schlanger (Archiv f. klin. Chir., B. 43, '92).

As a result of surgical intervention, the mortality from traumatic rupture of the bladder has, during the past fifteen years, been reduced from 90 to about 54 per cent. Of 18 cases of extraperitoneal rupture treated by operation, 10 ended in recovery and 8 in death. Of 34 patients in whom the peritoneal covering of the bladder had been involved in the injury, 14 recovered after operation and 20 died. Sieur (Archives Gén. de Méd., Feb., Mar., '94).

Treatment.—Shock.—Shock or collapse, though unreliable as a sign of severe injury to the abdominal viscera, is, nevertheless, an alarming condition, especially if the temperature is subnormal and the breath is shallow, and it should at once receive attention. The patient is placed in bed with the head low, and a free supply of pure air insured, supplemented with oxygen if practicable. Hot-water bottles are placed around him and he is covered with blankets previously warmed, if possible, or wrung out of hot water.

Two main elements have to be borne in mind in this class of cases: (1) that the state of shock is due to a direct commotion of the sympathetic system with probable inhibition of the heart's action, and (2) the possibility of an internal lesion which may involve death by exsanguination or the outpour into the peritoneal cavity of gastric or intestinal fluids. While the first condition calls for stimulants adapted to sustain the flagging heart and restore the action of the vasomotor, the agents employed should not be administered by the mouth, since, in case of rupture of the stomach, the duodenum, or jejunum, a portion, at least, of the fluid may be added to those that may have found their way into the peritoneal cavity. Rectal and subcutaneous injections should, therefore, be resorted to.

If no remedy be at hand, subcutaneous injections of 1 drachm of whisky or brandy may be employed, and repeated every five or six minutes until reaction occurs. A turpentine stupe or a fresh mustard poultice (not plaster) over the xiphoid cartilage, and a rectal injection composed of a tablespoonful of turpentine, a raw egg, and a teacupful of warm water, sometimes act with surprising rapidity. Hypodermic injections of ether, or, better still, tincture of digitalis with $^1/_{120}$ grain of atropia, repeated in fifteen minutes, are necessary to sustain cardiac action. After the second dose the digitalis may be injected alone several times more. These measures are greatly assisted by galvanic stimulation of the phrenic nerve, the negative pole, moistened in a solution of chloride of ammonium, being applied to the neck in the depression immediately in front of the sterno-mastoid muscle, and the positive over the epigastrium.

These means are sometimes inefficient and hypodermoclysis should be performed. If a fatal issue seems inevitable, saline transfusion is indicated.

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When the case is not very urgent, and the operator can act with deliberation, hypodermoclysis should be performed. When the symptoms are alarming and life is about to ebb, saline transfusion is indicated. T. L. Rhoads (Ther. Gaz., Oct. 15, '97).

Administration of morphine indicated in cases of great shock after injury. Use of drug should not be continued, one or two hypodermics usually being sufficient. McBurney (Med. Record, Apr. 23, '98).

Reaction.—As soon as reaction occurs in these cases another danger threatens the patient, that of hæmorrhage, which the state of collapse has so far prevented to a degree, unless an ex-

tensive injury have caused overwhelming exsanguination. In this event, however, the patient's recovery from the preliminary shock would hardly have taken place. Hence the necessity of closely watching the sufferer.

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After a severe abdominal injury the patient passes through a stage of collapse; through a stage when the diagnosis remains uncertain; through a period when the signs of hæmorrhage show themselves, and through a period of slow complications. Van Verts (Arch. Gén. de Méd., Jan., '97).

Cases of prolonged collapse sometimes turn out to be trivial, while a short period of it may be the prelude to the most grave complications. The former cases are, unfortunately, rare, and profound shock of any duration should be looked upon with suspicion. This is especially the case when a second period of shock is passed through—the "relapsing collapse" of Bryant—indicative of a secondary hæmorrhage or the giving way or separation of some damaged tissues.

That cases, clearly showing by their history and the active symptoms a grave injury, should be submitted to surgical measures as early as possible will hardly be gainsaid in the light of our present knowledge. An equally positive conclusion, based on every means of diagnosis available, will alone warrant the assertion that no serious injury is present: but if, on the other hand, doubt exists, abdominal section will alone insure the patient adequate protection. If nothing be found, no harm will have been done if precepts governing aseptic surgery have been closely followed; if a rent in the liver, an intestinal tear or rupture, a serious hæmorrhage be discovered and adequately dealt with, the patient will have received the benefit of all our art's resources.

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Hyperæsthesia of abdomen after injury is indication for operation. An increase in respirations to twenty-eight or thirty per minute makes indication absolute. Cold extremities also significant. Le Dentu (Le Progrès Méd., Oct. 27, '97).

In abdominal injuries when there is pain without cessation and nausea, it is best to operate. J. B. Murphy (Jour. Amer. Med. Assoc., July 9, '98).

The seat of rupture being located, the nature of the injury will determine the procedure to follow, linear enterorrhaphy being indicated in longitudinal ruptures, and circular enterorrhaphy in complete ruptures, a Murphy button being employed. These procedures are now generally preferred to an artificial anus. It is sometimes impossible to adequately adjust the edges of the wound, owing to the condition of the margin, and an omental graft must be used to cover the contused area so as to avoid a secondary perforation.

Considerable extravasation of fæces, blood, and other liquid or semiliquid material may have occurred into the peritoneal cavity. All chances for further contamination of the intestinal tract having thus been removed by closure of the rupture, the peritoneal cavity should be carefully cleansed by flushing with warm, sterilized water, a soft aseptic sponge being employed to gently mop all the surfaces that may, in any way, have come in contact with the infectious fluids. The cavity is then closed and free drainage insured.

Satisfactory results are obtained even in cases in which very great injury and ample opportunity for infection of all wounds have markedly compromised the issue.

Case in a young man who, some time previously, had been severely wounded in the abdomen by a wagon-pole. The intestines were much contused and very dirty. In some places the serous and muscular coats were torn through. The intestines and peritoneal cavity were carefully cleansed with a solution of iodine terchloride (1 to 1000) and the wounds united. The patient recovered without fever. Langenbuch (Deutsche med. Woch., Apr. 28, '92).

The after-treatment should be based upon the necessity of insuring rest for the intestinal tract for a few days. This may be carried out by administering opiates. The patient's strength should be sustained, however, by means of nutrient, but small and frequently-administered, enemata.

Under all circumstances, an abdominal injury should cause the patient to be watched several days. After an uncomplicated injury he should remain in bed and be placed on a milk diet for a few days. Anodyne applications over the abdomen and a little morphia, internally, if there is pain, is all that is usually required in these cases. In the less fortunate the procedure to be adapted varies according to the organ involved.

Intestines.—The probability of a rupture having been recognized, the abdomen should be opened by an incision through the linea alba, and any hæmorrhage quickly arrested. The next step is to locate the visceral injury. Of importance in this connection is the fact that in the majority of cases the rupture is due to compression against the spinal column. The spot over the abdomen upon which the blow carried being considered as the one end of an imaginary line and the centre of the vertebral column as the other end, the probabilities are that the rupture will be found near the linear axis.

In dogs with intestinal perforation there is constriction of the intestine above and below the point of injury, and swelling of the intestinal loop at the point of lesion. Lesions are always superposed in the direction of the spine; so that by going from injured portion of wall toward the spine the wounded loops are always found. Février and Adam (Revue Int. de Méd. et de Chir., Oct. 25, '94).

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Case of rupture of duodenum caused by kick of a horse. Exploratory laparotomy discovered lesion. Post-mortem it was found that the portion of the duodenum which lay against the spine and outside the peritoneum had been ruptured, and the intestinal contents had escaped along the spine downward as far as the pelvis. E. H. Bennett (Brit. Med. Jour., Apr. 23, '98).

Four cases of abdominal sections for severe injuries without external wounds. One should make a careful exploration of viscera before closing parietal incision. Three of the cases reported terminated fatally and at the autopsy it was discovered in two cases that a wound of the intestinal tract had been overlooked. A. M. Shield (Practitioner, Nov., '98).

Again, if the rupture cannot be readily found, hydrogen may be insufflated into the rectum, as advised by Senn, and the spot from which the gas escapes will indicate the location of the rupture,—approximately, in the case of the small intestine, and accurately below the ileo-cæcal valve.

Disorders, or lesions other than those sought after, are misleading conditions that should be borne in mind.

Lesions of the jejunum are sometimes difficult to locate.

Rupture of the jejunum. The patient was struck by the back rail of a barrow, across the upper part of the abdomen; severe pain, but not fainting. He was able to push the barrow a little further and to walk about a mile. No wound

nor any bruising evident over the abdomen; very little tenderness, and breathing not markedly thoracic. Temperature, 97° F.; pulse, 80 and weak. On the day following peritonitis present, and laparotomy performed by Mr. Cheyne. At the upper part of the cavity, behind the liver and stomach, the peritonitis was most acute, and a rent was found in the upper end of the jejunum. Patient returned to bed very much collapsed and died nine hours after the operation. C. J. Hood (Brit. Med. Jour., Apr. 5, '90).

Stomach.—When the symptoms of complete tear are recognized, the presence of the organ's contents in the abdominal cavity render an immediate laparotomy imperative. The incision should include the tissues between the xiphoid cartilage and the umbilicus. If the tear cannot be quickly found, repetition of the inflation with hydrogen-gas will help to locate it. As soon as located any bleeding vessel should be ligated, and the stomach evacuated and cleansed through the adventitious opening of any substance that may have remained in it. If the wound be a lacerated one, it may be necessary to pare its edges. This being done, the tear is closed, the mucous membrane being united with a continuous or interrupted suture, cut short, and the muscular and serous coats by the continuous Lembert suture. Closure of the laceration having removed all danger of further extravasation into the peritoneal cavity, the latter must be flushed with warm, sterilized water and mopped out with a soft sponge. The cavity is then closed and a drain left if the peritoneal surfaces have been exposed to contamination for some time.

Liver.—Especially when the history of the case seems to indicate the possibility of a lesion of this organ is careful watching imperatively demanded, owing to the violent hæmorrhages which they involve. Either this complication or peritonitis having been recognized, the abdomen should be opened at once in the middle line. The abdominal wound should be large enough, if possible, for the surgeon to see the liver, but in every case he ought to make a careful exploration with his finger, especially directing his attention to the convex and posterior surfaces of the organ.

When a rupture is found, the wound may either be cauterized, plugged, or sutured.

Paquelin's cautery can hardly arrest hæmorrhage from large vessels in deep wounds of the liver; here the suture may be used. The blood-pressure in the liver-vessels is low; hence arrest of hæmorrhage can surely be obtained by the tampon. The wound in the liver can also be better observed where the tampon is used. Three personal cases in which the measures were successful. Weidler (Deutsche med. Woch., Sept. 13, '94).

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Where the wound is a large one the combination of sutures, mattress-sutures, and tamponade may be necessary; but, as a rule, the tampon should be used only in cases where sutures have failed to check the hæmorrhage. Of the three methods the thermo-cautery is of least value; it will check only moderate parenchymatous hæmorrhage, is of no value in extensive wounds, and is apt to be followed by secondary hæmorrhage. Schlatter (Annals of Surg., Apr., '97).

A jet of steam to control hæmorrhage from the contused liver or omentum, first recommended by Sneguireff, has antiseptic as well as hæmostatic virtues. When the tampon is employed, the surrounding peritoneal cavity should be shut off by a few sutures. Doyen (Le Progrès Méd., Oct. 30, '97).

Plugging with antiseptic or aseptic gauze seems to give the best results, one end of the gauze being left out at the

angle of the abdominal wound. The plug should be removed not earlier than the forty-eighth hour, lest there should be a recurrence of the hæmorrhage, and not later than the fourth day, lest a biliary fistula should be formed. When the bleeding is very severe sponges mounted on holders appear to produce more satisfactory pressure than simple plugging, which is, perhaps, better reserved for slighter injuries. Hot-water irrigation may be of advantage in these cases. A ligature should be applied to any large vessel which is seen to have been torn. Sutures are particularly useful when the laceration extends deeply into the substance of the liver, since by their means the edges of the wound may be brought lightly together and the bleeding can be controlled. Draining of the pelvic pouch, by an opening just above the pubis, serves best to give free passage to subsequent discharges. The capsule should be included in the stitches. The prognosis is very unfavorable when peritonitis has occurred, but something may still be done to prevent the fatal issue by opening and afterward draining the abdominal cavity.

Spleen.—After a simple contusion the spleen soon returns to its normal condition without further trouble, and a few days in bed, coupled with strapping of the side to limit motion, usually suffice. When, however, there is laceration of the parenchyma the convalescence is slow, abscesses following in quick succession. After a time these cease and recovery is uninterrupted. Symptomatic treatment, revulsion over the organ and tonics, may shorten the duration of such cases.

When the symptoms do indicate that exsanguination of the patient is taking place, death will most probably follow, although the hæmorrhage is not as copious as it can be in tears of the liver, the splenic capsule being more elastic than that of the latter organ. Removal of the organ should be resorted to. The abdominal wall is opened by means of an incision through the left semilunar line and the peritoneum is freely opened. The hand being introduced into the cavity, all adhesions are torn up and the organ is brought to view. The vessels entering the hilum are then clamped and the organ is removed. The stump is ligated and, after sponging out the abdominal cavity, the wound is closed.

Kidney.—The majority of mild cases of perirenal extravasations of blood and urine recover as the result of rest and expectant treatment. The patient should be kept in bed and his diet limited to liquids, the best of which is milk; this beverage requires, besides, the least physiological labor from the injured organ. The nourishment of the patient may further be sustained by rectal injections of beef-tea, and these should entirely be resorted to if there is vomiting, the latter tending greatly to encourage hæmorrhage. When the latter occurs in the direction of the bladder, there is likely to be accumulation of blood-clots, which, if small, will readily pass out with the urine. Frequently, however, the clots are large and cause retention of urine and marked tenesmus. A large catheter should therefore be introduced and kept *in situ* when the hæmaturia is marked, and the bladder occasionally washed out with a weak boric-acid solution. Median urethrotomy to remove clots and relieve retention sometimes becomes necessary in these cases. When the symptoms do not improve under these measures, an incision should be made, exposing the seat of injury, the extravasation removed, and the parts restored, by appropriate measures, to their normal conformation.

There is great danger in delaying operation in these cases; the decomposition of the clots and the cystitis which is excited by their presence, as well as the frequent catheterization needed, expose the patient to all the dangers of suppuration of the wounded kidney, and also to the risk of infection. Henry Morris (Clin. Jour., Aug. 1, '94).

The dangers of rupture of the kidney are mainly hæmorrhage and sepsis. When, therefore, the symptoms are such as to indicate marked hæmorrhage or sepsis, and especially if a tumor form quickly in the lumbar region, an exploratory operation should at once be done. If severe laceration be present, or the kidney's functions be practically compromised, or the hæmorrhage be such as to require ligation of the renal vessels, lumbar nephrectomy should immediately be performed, primary nephrectomy being safer than secondary removal of the organ.

Five cases of traumatism of the kidney, all recovering. Operative interference required in but one instance. Primary operative interference in these cases should be exceptional. Hæmaturia is the only indication for it. Tuffier (Le Bull. Méd., Apr. 8, '94).

Eleven cases of kidney traumatisms, with eight recoveries and three deaths, expectant treatment having been employed. Wagner (Deutsche Zeit. f. Chir., B. 34, p. 98, '93).

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Five cases of primary nephrectomy with one death, a mortality of 20 per cent.; and thirteen cases of secondary nephrectomy with five deaths, a mortality of 38.5 per cent., showing that secondary nephrectomy is nearly twice as fatal as primary.

As to the route of the operation; of three cases of abdominal nephrectomy, one died, a mortality of 33.3 per cent.; and fourteen of lumbar nephrectomy, of which four died, a mortality of 28.6 per cent. W. W. Keen (Annals of Surg., Aug., '96).

Bladder.—When a patient presents the history of a severe abdominal contusion or crushing, followed by inability to micturate, the catheter should at once be used.

Most important signs of vesical rupture: a peculiar pain felt at the time of the injury; chilling of the surface of the body, which persists for some time; an urgent desire to micturate, which the patient cannot satisfy; the absence of any vesical swelling above and behind the pubes, and also the absence or the presence, but in very small quantity, of urine in the bladder. Catheterizing, though valuable, ought not to be practiced except with very great caution. Sieur (Arch. Gén. de Méd., Feb., Mar., '94).

The presence of hæmaturia will indicate a lesion in the urinary tract, kidney, or bladder. If the urine withdrawn is observed to be well mixed with blood and, instead of red, it appear brown and smoky, the lesion is probably one of the kidney. If, on the contrary, the urine be bright-red, the probability is that the bladder has been torn. In the latter condition the diagnosis may also be assisted by the quantity of fluid passed at a given time. If, when the catheter is introduced and after a history marked with shock, no urine is obtained, the chances are that not only the bladder has been ruptured, but that the laceration is extensive, the opening having allowed the vesical fluids to escape into the abdominal cavity. A free flow, on the contrary, would tend to show that the tear, if any exist, is small. Of course, the invagination of the intestines into the vesical opening, or a valve-shaped laceration, may cause the same favorable signs to exist, thus misleading the diagnostician. Very small lesions may be present, sufficient to allow the urine to

escape, drop by drop, into the surrounding parts. Detection of them is very difficult, the subsequent complications alone showing the presence of extravasated fluids.

The presence of any tear, except very small ones, may also be ascertained by injecting a weak boric-acid solution into the organ, through the catheter. If a rupture be present, the bladder will not fill and rise above the pubis. Filtered air may be used for the same purpose, but it is less satisfactory, owing to the danger of secondary collapse.

> Case in which diagnosis was established by inflating the bladder with air forced in by two or three compressions of the rubber ball of an ether-freezing microtome. The amount of air to be introduced need only be very small, and only moderate pressure is required for the inflation.
>
> The introduction of air through the rent into the abdominal cavity, even in small quantity, was attended by a profound disturbance in the patient's general condition, which passed off on opening the abdomen and allowing the free air to escape. The method should not be applied till the patient is on the operating-table, so that, should the collapse threaten life, the abdomen could be opened at once. W. J. Walsham (Univ. Med. Jour., July, '95).

The urine may have passed into the prevesical connective tissue outside the peritoneum, or the vesico-rectal or vesico-uterine space, owing to a rupture in these locations. This constitutes the extraperitoneal lesion. Cellulitis and sloughing rapidly ensue without subsequent involvement of any organ in the neighborhood of the lesion, the vagina, the rectum, etc., the patient dying from septicæmia.

> Two cases of uncomplicated intraperitoneal rupture of the bladder. Death probably due to the absorption of the urine by the peritoneum and to its continuous accumulation in the blood. In both cases the rupture was situated on the posterior wall. There were no signs of acute peritonitis in either case. The patients lived probably five and three days, respectively, after the accident. Joseph Coats (Brit. Med. Jour., July 21, '94).

To ascertain whether a tear be extraperitoneal or not, a measured quantity of a weak boric-acid solution is injected through the catheter. If the full amount is not recovered, the chances are that the rupture is extraperitoneal.

> In investigating a suspected case of rupture the greatest care should be taken to keep the bladder aseptic; so that, in case there is a rent, germs cannot spread into the tissues, and especially into the peritoneal cavity. In making the test also of injecting fluids in measured amounts and then observing whether the same amount is voided, care should be taken not to distend the bladder more than very moderately, lest a partial rupture be converted into a complete one. H. Aue (Deutsche Zeit. f. Chir., p. 351, '92).

Rupture into the peritoneal cavity, the intraperitoneal form of lesion, is less urgent as far as symptoms go. One, and even two, days may elapse before active symptoms appear; but, when they do, rapid progress toward a fatal issue from general peritonitis is the rule.

Uncomplicated contusion of the bladder readily yields to a few days' rest, the application of ice, and general symptomatic treatment. When, however, there is cause for suspecting a rupture from the nature of the accident or the violence of the blow, the catheter should at once be introduced. The presence of blood renders operative interference imperative. After the rectum has been distended with a rectal bag an incision three inches long is made in the middle line of the hypogastrium, beginning half

an inch below the upper edge of the pubes, as in suprapubic lithotomy.

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It is best to first open the prevesical space, when it can be determined whether the rupture is extraperitoneal, and, if so, the necessary treatment to be carried out. If the rupture is found intraperitoneal, the abdominal incision is carried upward and the peritoneal cavity opened, when the rent is located and properly disposed of. John B. Deaver (Univ. Med. Mag., July, '96).

The peritoneum is then carefully rolled up, along with the prevesical fat. The bladder being thus exposed, search for the rupture is the next step. The rent is usually found along the posterior surface vertically down from the urachus; frequently an extravasation of blood and urine indicates the spot. Occasionally, however, considerable difficulty is experienced, and opening of the organ is necessary so as to permit the introduction of the finger, and thus allow of exploration of its inner surface.

The rupture may be extraperitoneal or intraperitoneal. If an intraperitoneal laceration is found, the incision should be extended upward, the peritoneal cavity opened, and the cystic wound closed with fine silk by means of Lembert sutures, one-eighth of an inch apart, including only the peritoneal and muscular coats. The mucous membrane of the bladder should be respected. Important, in this connection, is the necessity of ascertaining that the sutures will hold; this may be done by distending the bladder with a lukewarm milk or an alkaline solution.

Of the 28 cases recorded by various operators 11 recovered and 17 died. Of the 11 that recovered, in only 1 was peritonitis present at the time of operation, while, conversely, of the 17 that died, in 8, and probably in 9, peritonitis had already set in. The causes of death in the 8 cases in which there was no peritonitis at the time of operation were: in 5, shock or hæmorrhage or the two combined, and in 3 peritonitis, the peritonitis in 2 out of the 3 being due to leakage of the rent or giving way of a suture. In no fewer than 4 out of the 28 cases was the bladder found, at the post-mortem examination, to leak. The importance of testing the competency of the bladder by injecting milk or other bland and easily-detectable fluid could not, therefore, be too strongly urged. W. J. Walsham (Univ. Med. Jour., July, '95).

The abdominal cavity is then carefully irrigated and closed, leaving a drain if there is any possibility that fluids will accumulate in any of the surrounding tissues.

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Case of rupture of the bladder: a rent about four inches in length in the middle line on the posterior surface, a large amount of blood-clot and urinous fluid escaping through the abdominal incision. Fatal result attributed to the omission of using a drainage-tube in Douglas's pouch. A large amount of clot and urinary fluid had collected among the coils of intestine; and, though much time was employed in trying to completely remove it, such could not have been done. Objection to using a drainage-tube had been that the bladder-wound was so exactly in the middle line that any tube must necessarily press on it and retard its union. Percival (Brit. Med. Jour., May 22, '97).

Wounds.

Wounds of the abdomen may be *non-penetrating*, when the abdominal walls alone are injured, and *penetrating*, when the peritoneum is included in the lesion, irrespective of the instrument (pistol, knife, etc.) with which the lesion is produced.

Non-penetrating Wounds.

Non-penetrating wounds are usually

due to pointed cutting or blunt instruments.

The lesions caused by a pointed instrument, involving the skin and muscles only, are usually very slight. With due aseptic precautions careful exploration of the wound with the finger may be resorted to if the visceral examination do not suffice. Probes had better not be used, lest the wound be transformed into a penetrating one.

Lesions caused by cutting instruments (knives, swords, etc.) vary in importance according to their depth and length. When the muscles are cut, the support for the abdominal organs is compromised, and ventral hernia may follow, unless great care be taken when the wound is closed.

Lesions caused by blunt bodies (such as shot, glancing bullets, and fragments of shells, etc.) are usually attended by symptoms of contusions corresponding in intensity with the force of the blow. Severe laceration of the abdominal tissues may thus be caused and death occur from intestinal lesions.

The hæmorrhage attending these various kinds of wounds is usually slight. There is considerable ecchymosis, but this soon disappears. Occasionally shots or bullets become imbedded in the abdominal tissues.

Treatment. — After carefully arresting bleeding, cleansing and disinfecting the wound, the tissues are united. In deep incised wounds the prevention of ventral hernia should be borne in mind, and the cut muscular tissues brought accurately together by means of catgut sutures. This being done, silk sutures are also introduced and brought out to the surface, thus including the muscles and skin. Capillary drains are alone to be used, if drainage is at all necessary, larger drains affording opportunity for the formation of a ventral hernia. The abdomen should be supported by means of a bandage applied over the dressing and the patient kept in bed until complete repair of the wound has taken place; from two to five weeks, as a rule. The bandage should be carried long after recovery, and the patient be warned of the danger he might incur by violent movement or strain.

Penetrating Wounds.

The softness of the tissues of the abdominal parieties causes them to be easily penetrated, and the organs within the cavity are all vulnerable for the same reason. The interstices between them occasionally allow the harmless passage of a weapon or bullet, but such cases are extremely rare, only nine such cases having been recorded during the Rebellion.

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Case of a young man who was shot in the abdomen about three inches to the left of the umbilicus. Wound immediately explored by enlarging it; the bullet had entered the abdominal cavity. The latter freely opened; it contained but little blood; no evidence of intestinal perforation, notwithstanding careful search. The bullet found to have entered the opposite posterior abdominal wall a little to the left of the aorta. The ends of two epiploic appendages of the sigmoid flexure had been cut by the bullet. About two-thirds of the length of the small intestine were lifted out in search for a perforation, but none was found. The patient made a good recovery.

But one other case of passage of a bullet through the abdomen without wounding the intestine or other viscera had come under the author's care. L. A. Stimson (Annals of Surg., Mar., '97).

Three cases of penetrating wounds without perforation of any of viscera. In one a 44-calibre ball entered just beneath the liver, nicking transverse colon;

mucous coat of bowel was not injured. Abdomen opened and torn coats of bowel sutured. Laparotomy done three hours after receipt of injury. Uninterrupted recovery. In other two cases diagnosis was made by laparotomy. Each case recovered. J. C. Oliver (Cincinnati Lancet-Clinic, May 7, '98).

The missile may graze the peritoneum and barely miss it along with the deeper organs. Unfortunately wounds causing laceration of one or more of the abdominal viscera are the most frequent, and their fatality is proverbial unless a timely diagnosis allow of prompt protective measures.

As is the case in contusions, the direction from which the missile or stab comes is of great importance. A bullet arriving from the side and striking near the linea alba would probably create a button-hole wound or bury itself in the abdominal walls. A bullet coming from the front, on the contrary, would most probably perforate the organs in its axial line of flight. If the bullet has passed through the body an imaginary line between the entrance and exit will probably indicate the organs injured, including, of course, the peritoneum. Here again, however, the spinal column may cause deviation when the initial velocity of the bullet is small, and a deceptive line of injury furnished. To positively determine the course of a bullet is difficult in many cases.

In stab wounds the opening is frequently of a sufficient size to permit prolapse of the omentum, an evident proof that the abdominal cavity has been penetrated. This rarely occurs in bullet wounds unless a large projectile, or a bullet coming from either side of victim, have caused comparatively large solution of continuity of the tissues. Prolapse of the omentum is most frequently observed in lesions of the left side. Coils of the small intestine are also frequently prolapsed and, in rare cases, the stomach, the liver, or the spleen have appeared between the lips of the wound.

Symptoms.—As is the case after contusion, penetrating wounds of the abdomen may give rise to no symptoms capable of affording any reliable clue to the extent of the internal injuries. Profound shock may be present and no serious lesion exist.

Case of a man brought into one of the surgical wards with an external wound. He was lifted to bed absolutely helpless and a serious gunshot wound of the abdomen suspected from gravity of symptoms. The bullet found in the leg of his drawers. The patient was unable to get out of bed for hours. A. B. Miles (Southern Surg. and Gynec. Trans., vol. vi, p. 183, '94).

Severely injured individuals may, on the contrary, present no acute symptoms and, perhaps, walk or ride a considerable distance before showing noticeable evidence of their condition.

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Case of 15-year-old boy who sustained penetrating wound of the abdomen, with protrusion of more than a foot of intestine, by being horned by a bull. There was total absence of shock, although the accident occurred six hours before the boy came under observation, and the patient was brought in a country-cart over five miles of very hard road. George Bidie (Brit. Med. Jour., Sept. 24, '98).

Case of man, native of Burmah, aged 30 years, stabbed in the buttock; transverse wound one and a half inches long at level of the lower end of the sacrum and just to the right of the middle line was found. Probe passed in about one inch and impinged upon bone. Rectum examined and no injury detected. Pulse was good; patient complained of little pain and there were no symptoms of shock. He died about twelve hours after receipt of injury. Post-mortem track of wound passed between the sacrum and

coccyx. Floor of pelvis to right of rectum was perforated. Coil of small intestine midway between stomach and great intestine hanging in recto-vesical pouch was penetrated. Abdomen contained great quantity of blood, source of which not demonstrated. All other organs were healthy and uninjured. Duer (Indian Med. Record, Apr. 1, '98).

Case of dragoon, stabbed in the left iliac region. Expectant treatment was adopted; next morning patient felt so well that he was allowed a few spoonfuls of milk. Few hours later urgent signs of generalized peritonitis showed themselves. Laparotomy was performed, but patient was so weak that only small intestine examined, result being negative. Shortly afterward man died; post-mortem showed large intestine had been pierced. Caillet (Journal Amer. Med. Assoc., Apr. 30, '98).

Profuse hæmorrhage alone gives rise to symptoms denoting a grave lesion: rapidly progressive exsanguination or acute anæmia; nausea or vomiting; weak, rapid, and sometimes irregular pulse; dilated pupils; cold sweats; yawning, ending in convulsions and coma. Shock is likely to be progressive in these cases.

Serious visceral lesions may be accompanied by little or no shock, while an insignificant wound of abdominal wall may be attended by profound shock. In bullet and other injuries maximum degree of shock reached early, while depression, incident to hæmorrhage, slower in its advent. H. M. Taylor and Landon B. Edwards (Va. Med. Monthly, Aug., '95).

Fatal cases of marked laceration of liver and bowel in which there was neither shock, hæmorrhage, nor high pulse. W. L. Robinson (Jour. Amer. Med. Assoc., Dec. 15, '94).

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If the shock is progressive it means internal hæmorrhage. When a patient is first seen he may be profoundly shocked and not be much disturbed, but, if he continues to become more shocked, it means hæmorrhage. Shock at the time of injury does not mean hæmorrhage, but later on it does. L. McLane Tiffany (Pacific Record of Med. and Surg., Feb. 15, '96).

The only symptoms that are present in practically all cases are pallor and vomiting, the accompaniments of any severe blow on the abdomen, and therefore of no value whatever as differential signs. The temperature is of no assistance in these cases.

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Cases showing that with normal temperature a fatal injury (without operation) may be present, while, after operation, a subnormal temperature may be expected; 95° F. has been recorded. L. M. Tiffany (Amer. Jour. Med. Sci., May, '96).

Diagnosis. — On general principles dangerous complications are to be expected when marked shock, nausea, vomiting, hiccough, anxiety, intense thirst (indicating a probable involvement of the peritoneum), and insomnia are present. Besides these indications there are others peculiar to each organ which greatly assist in establishing at least an approximately certain diagnosis.

Intestines.—According to Senn, bullets striking the abdomen antero-posteriorly rarely cause more than four perforations, while oblique or transverse shots are likely to produce a much larger number of lesions,—from fourteen to sixteen. On general principles, however, a penetrating wound may always be considered as having caused a lesion of the intestines.

The most important symptom is the escape of intestinal gases and more or less fluid substances through the wound. The mere presence of emphysema around the wound is of no value, however, since

air is generally forced into the wound by the bullet.

Free hæmorrhage from the wound tends to indicate an intestinal lesion; if the stools also contain blood the diagnosis may be considered as certain.

In small wounds of the bowel the mucous membrane pouts out and closes the orifice; as soon as peristalsis occurs it is drawn in, and there may be an escape of a small fæcal mass. A large amount of fæcal matter may thus be extruded through a small opening. Klemm (Deutsche Zeit. f. Chir., B. 33, H. 2, 3, '92).

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In wounds of the intestines of very short extent (the most frequently met with) the mucous membrane makes a hernia between the lips of the wound, obstructing and thus preventing the flow of the fæcal matter, and in consequence avoiding the onset of peritonitis. The gas would pass through the wound, facilitating at once the passage of these materials. Tobias Nunez (Brit. Med. Jour., Oct. 9, '97).

Probes have been discarded in penetrating wounds, owing to the irregular course followed by the bullet in many cases and the danger of creating a false passage. Digital exploration of small wounds furnish but little information, while in bullet wounds there is danger of pushing into the peritoneal cavity what foreign substances may happen to be present.

The majority of surgeons now favor enlargement by an incision at least two inches in length, intersecting the bullet or incised wound. Layer after layer of tissue is carefully dissected on each side of the track, the walls of which, in gunshot wounds, are usually darker than the normal tissues, owing to contact with the lead or powder-products of combustion. Using the grooved director to divide the tissues and the hæmostatic forceps to grasp any bleeding vessel, the peritoneum is finally reached, when the certainty that a penetrating wound is present or not may be established. If practiced with strict aseptic precautions, this procedure does not expose the patient.

The great importance of always opening the abdomen in cases of penetrating wounds is to be insisted upon. Cabot (Boston Med. and Surg. Jour., July 25, '95).

Study of fifty-six cases showing that proof of penetration through peritoneum should be sought by enlargement and careful investigation of original wound. Penetration having been found, immediate enlargement of the wound should be made. C. L. Scudder (Boston Med. and Surg. Jour., July 25, '95).

Stomach.—Hæmatemesis is a frequent symptom of penetrating wound of this organ and a much more valuable one than in contusion, since, in the latter, a slight laceration of the mucous membrane may produce it. The blood may be pure, but in the majority of instances it is mixed with partially-digested alimentary semiliquid material. If the wound is sufficiently large to allow the contents to escape through it the nature of the injury is, of course, clear, but an important complication is to be apprehended,—extravasation into the peritoneal cavity capable of causing peritonitis. If this is circumscribed, adhesions are formed and the patient recovers. Frequently, however, general peritonitis follows, ending in death. Hence the importance of an early recognition of extravasation.

Besides hæmatemesis and the presence of gastric fluids, there are usually present in such injuries the marked symptoms witnessed in cases of contusion: rapidly progressive anæmia, pallor, fluttering pulse, etc.

Senn's method (rectal insufflation of hydrogen-gas) as a preliminary to oper-

ation, and as a means of diagnosis, is distinctly inferior to an exploratory incision in facility, efficiency, and security. L. A. Stimson (N. Y. Med. Jour., Nov. 2, '89).

Liver.—A wound of the liver gives rise to all the symptoms observed when a contusion has caused laceration of the organ. Intermittent pain, radiating in various directions, especially toward the shoulder, if the convex portion of the organ is torn, and in the direction of the waist, if the concave or inferior portion of the organ is the seat of injury. There is marked pallor, superficial itching, and, later on, jaundice. The stools may be clay-colored, thus indicating the absence of bile.

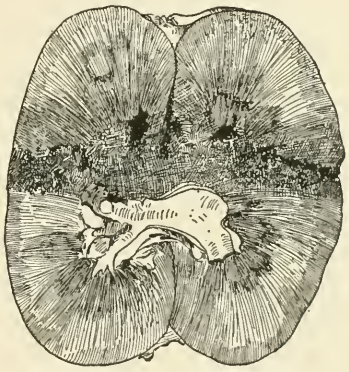
The hæmorrhage varies in these cases according to the cause of the lesion; one caused by a bullet is prone to be accompanied by considerable and frequently fatal bleeding. Stab wounds, when the weapon is not large, do not give rise to considerable hæmorrhage. A copious flow of blood from a wound in the hepatic region indicates that the liver is involved.

The flow of bile through the external wound is a valuable sign, but it is seldom that this secretion can be obtained alone, blood being usually mixed with it.

Spleen.—In cases in which the spleen is wounded the diagnosis can easily be established by the location of the external opening and the direction of the track. As is the case in contusion, there is marked local pain and profuse bleeding, which, if the organ is greatly lacerated, may soon prove fatal. This is apt to occur after gunshot wounds at close range, the organ under such circumstances becoming pulpified. Puncture wounds are less likely to produce fatal hæmorrhage.

Kidneys.—The symptoms frequently accompanying wounds of the abdominal organs, extreme pallor, weak pulse, cold extremities, nausea, and vomiting are apt to be most marked when, besides the organ itself, the peritoneum has been pierced.

A wound of the kidney gives rise to severe pain in the majority of cases, but this symptom may be absent. As in cases of laceration, the pain radiates in various directions, especially in the direction of the external genital organs. The testicle of the corresponding side, besides being the seat of considerable suffering, is frequently raised by spasmodic contractions of the scrotum.



Perforating gunshot wound of the kidney. (*M. H. Richardson.*)
(Annals of Surgery.)

At first a small quantity of bloody urine may be passed, but this is often followed by vesical tenesmus and complete retention, due to the presence of clots in the bladder.

Much information is sometimes obtained by a close examination of the wound of exit. If the track of the bullet be antero-posterior and the missile have entered from the front and penetrated the kidney, the exit wound will be found in the lumbar region. It is frequently found in this situation to contain urine,

a positive indication that the organ or its annex, the ureter, has been wounded.

If the wound of entrance be in the back, its location over the site of the kidney may suggest a lesion of the latter; but the urine test will only be of value if the projectile only penetrate the kidney without perforating it. If it penetrate the organ, the extravasation will take place into the peritoneal cavity. The same will be the case if the missile enter from the front without going through the organ. Bullets buried in the renal parenchyma either become encysted or cause abscesses, and pass out through the ureters or into the adjoining parts.

Bladder.—The symptoms vary according to the location of the wound. A perforation between the symphysis and the peritoneum above does not give rise to general symptoms; whereas shock, pallor, weak pulse, vomiting, etc., may be much marked when the peritoneum is involved in the injury. In all cases, however, severe pain is experienced at the site of the lesion and radiating to the thighs and testicles.

The passage of urine soon becomes very difficult and spasmodic. It may be voided, drop by drop, for a long while, notwithstanding the efforts of the patient, then suddenly gush out for a few moments and again flow slowly. This symptom may be due to accumulation of clots or to spasm of the urethra. If the catheter is passed, hæmaturia becomes evident when the bladder has been penetrated,—a characteristic sign.

As in the case of rupture due to contusion, infiltration may take place through the wound into the neighboring tissues: any obstacle to the free passage of urine greatly encourages this. Hence the necessity, in all bladder lesions, of keeping the organ as free as possible by the frequent use of the catheter.

Prognosis.—The statistics so far published differ so widely that it is difficult to reach a definite conclusion. It is certain, however, that gunshot wounds are more frequently fatal than stab wounds, but that stab wounds, in which the peritoneum is penetrated, are fully as fatal as gunshot wounds.

Intraperitoneal wounds of the bladder are uniformly fatal, while extraperitoneal wounds gave a mortality of only 15 per cent. Gunshot wounds of the kidney are attended with a death-rate of 44 per cent. In gunshot wounds of the liver the mortality is 26.8 per cent. Wounds of the spleen are difficult to diagnose; mortality 65 per cent. Wounds of spinal cord in the lumbar region result fatally. Mortality of wounds of the pelvic bones also very high. Seliger (Prüger med. Woch., '92).

Statistics collected by various writers, showing the mortality to range from 65.6 per cent. to 70.67 per cent. Shock is one of the chief causes of these results. Conner (Jour. Amer. Med. Assoc., Sept. 16, '93).

Early death after accident is not from shock, but from sepsis; the latter only occurs when extravasation takes place. Jas. G. Mumford (Boston Med. and Surg. Jour., July 25, '95).

Literature of '96-'97-'98.

Case of revolver wound of the intestines, bearing out the contention of Dr. Marion Sims, in 1882, that septicæmia, and not peritonitis, is the usual cause of death in gunshot wounds of the abdomen. Within fourteen hours of the accident several pints of bloody serum had already been poured out in the peritoneal cavity, while the intestines were congested, but had not lost their glossy appearance. George A. Pirie (Brit. Med. Jour., May 16, '96).

Not infrequently cases of perforating gunshot wounds of the abdomen will recover without active surgical interference. Four laparotomies for perforating

gunshot wounds of the abdomen were performed at the First Division Hospital, the only cases in personal knowledge during the Cuban campaign. All of patients died. Abdominal section is always justifiable in cases of internal hæmorrhage sufficient in amount to threaten life. N. Senn (Med. Record, July 30, '98).

Immediate operation is the best and wisest course to pursue in perforated, punctured, and gunshot wounds of the abdomen. This is the rule which is followed in the University of Munich. Seven gunshot wounds treated with a mortality of 58 per cent., and 22 stab wounds, with a mortality of 18.1 per cent. Series of 30 cases treated by conservative methods between 1876 and 1890, the mortality having been 46.6 per cent. Paul Ziegler (Münch. med. Woch., Mar. 8, '98).

Case of patient who was stabbed below ribs on left side, sustaining an incised wound of transverse colon at its attached borders between the layers and mesocolon, an incised wound of the diaphragm two inches in length, and a penetrating wound of lung. Owing to critical condition of patient, no attempt was made to close intestinal wound; that in lung was packed; 4 sutures inserted in diaphragm, and a gauze drain introduced down to wounded bowel. One month later patient was dismissed cured. W. H. Fisher (Annals of Surg., Oct., '98).

The kind of weapon inflicting the injury plays an important rôle in this connection. A triple-edged bayonet is more likely to produce a serious laceration than a flat blade. Again, wounds caused by small weapons, such as a Flobert rifle, for instance, would hardly produce lesions to be compared to the old Enfield or Minie rifles, which sometimes caused a large portion of an organ to protrude through a wound of exit the size of an apple.

Experiments showing that wounds made with small bullets, 22 calibre and 1 drachm in weight, were more apt to be followed by an adhesive inflammation than those by missiles of greater size, and fæcal extravasation less apt to occur. Bullets which enter the abdominal cavity pass in a nearly absolutely straight line from the orifice of entrance through the peritoneum to that of exit, or to their final stopping place in the viscera. The theory of a glancing bullet is not tenable. McGraw (Trans. Amer. Surg. Assoc., vol. vii, '89).

Portions of the solid viscera are sometimes cut off or shot off, leaving a gaping tear, which greatly compromises the issue. Again, as is often the case with the liver, the bullet, or any foreign material dragged in by the latter, may lead to complications which greatly reduce the chances of recovery.

An important factor is the time elapsing between the receipt of the injury and that at which competent treatment is applied in mild cases. This is especially true as regards the early utilization of surgical measures when these become necessary. The sooner these are instituted the more favorable the prognosis, especially during the first ten hours.

Statistics of 154 laparotomies for gunshot wounds: Operation five hours after traumatism; mortality, 52.7 per cent. Operation ten hours after traumatism: mortality, 74 per cent. Operation twenty hours after traumatism; mortality, 73.9 per cent. Operation after twenty hours after traumatism; mortality, 78.2 per cent. Hæmorrhage kills early, if at all. Edouard Adler (Jour. de Méd. et de Chir. Prat., Sept. 25, '92).

Intestines.—The prognosis depends greatly upon the nature of the lesions. Stab wounds opening the intestine lengthwise, if small, often heal of their own accord; transverse wounds are more serious, while complete section of the bowel is a very dangerous complication. Gunshot wounds show a great fatality. Prior to the introduction of antiseptic surgery the mortality exceeded 90 per

cent.; since then, the mortality has been decreased to 43 per cent. in cases operated during the first twelve hours. When all surgeons will handle the intestines with gentleness, operate quickly, and otherwise reduce the chances of shock, it is probable that the prognosis will be greatly improved. Perforations of the descending colon and sigmoid flexure are seldom fatal; those of the transverse colon give a worse prognosis, by the formation of fistulæ, adhesions, and abnormal communications. Again, diathetic conditions may compromise recovery.

Case of abdominal section for multiple gunshot wounds of the intestine complicated by tuberculous peritonitis, the entire peritoneum being studded with the typical nodules. Post-mortem examination revealed no additional wound. All the wounds were found adequately sutured. Thomas S. K. Morton (Phila. Polyclinic, Nov. 30, '95).

Notwithstanding great injury and other conditions greatly reducing the chances of recovery, recoveries are occasionally obtained.

Case of a boy who had been tossed by a bull. Mass of intestinal convolutions protruded and remained exposed three hours; washed in 3-per-cent. carbolic solution and returned. Recovery. Appenzeller (Medicinisches Corres.-Blatt des Wurttembergischen Arztlichen Landesverein, No. 11, '92).

A case of pentrating knife-wound of the abdomen in which the descending colon was wounded, protruded, and strangulate . Severe shock at the time of operation, and the wound covered with clotted blood and fæces. Uninterrupted recovery followed operation. R. K. Smith (Va. Med. Monthly, Feb., '94).

Case of recovery after large wound of the abdomen through which protruded ten to twelve feet of bleeding small intestine covered with dirt, perforated and torn in eight or nine places. Shepherd (Montreal Med. Jour., Dec., '94).

Case of recovery in a man in whom sixteen bullet-holes of the intestines were found and closed. Bennett (N. Y. Med. Jour., Jan. 19, '95).

Stomach.—Uncomplicated wounds of this organ frequently yield without trouble when the bullet, blade, or other instrument causing the perforation is small, especially if the stomach was empty at the time the injury was inflicted. The mucous membrane bulges out and forms a plug which obturates the hole until reparative processes have sealed the aperture on the peritoneal side. Complicated cases, in which the lesions are extensive, soon reach a fatal issue if deprived of timely surgical intervention.

Literature of '96-'97-'98.

An individual shot when the stomach is distended with food will have a better chance to recover if subjected to an operation and the peritoneal cavity washed out. The probability is that during efforts at vomiting part of the contents of stomach will be extruded through perforations into peritoneal cavity. R. B. Hall (Cincinnati Lancet-Clinic, May 7, '98).

Liver.—The prognosis of wounds of the liver depends mainly upon the complications. If the patient does not die from hæmorrhage soon after the receipt of the injury, he is still exposed to the results of extravasation into the peritoneal cavity, the presence in the liver of a foreign body,—the bullet and what material it may have forced into the wounds,—etc. Peritonitis, hepatitis, and abscess are, therefore, dangers to be taken into consideration. Hepatitis and abscess are much less to be feared, however, from stab wounds, no foreign body being left behind, unless, as in dueling, the sword-point strike the spinal column, causing the blade to break. In such an

event, however, the hæmorrhage would probably prove mortal very rapidly.

As to mortality, the statistics of Edler, Mayer, and others show it to average about 50 per cent., including the cases attended by complications.

Records of 272 cases of wounds and injuries of the liver: Cases divided into those due to direct and those due to indirect violence. Direct injuries, 164 cases, with 58 deaths,—a mortality of 35.3 per cent.; indirect, 108 cases, with 92 deaths,—a mortality of 85.2 per cent. The former class again divided into two groups, of 54 punctured or incised wounds, 24, or 44 per cent., proved fatal, while of 110 gunshot wounds only 34, or 30 per cent., were mortal. Of the 272 cases, 150, or 50.5 per cent., died. These figures correspond very closely with the tables of Edler, which showed a mortality of 39.1 per cent. after shot wounds and 55 per cent. of all cases. Homer Gage and R. Lorini (Boston Med. and Surg. Jour., Apr. 28, '92).

Spleen.—Slight punctured wounds of the spleen are not mortal unless complicated with laceration of a large artery. They are sometimes followed by abscesses which heal after a prolonged period in the great majority of cases. Severe punctured wounds are dangerous in proportion, but if the primary hæmorrhage is not such as to cause an early fatal issue, the chances of recovery are about those of slight wounds.

Gunshot wounds are much more serious as a result of rupture of the spleen taking place under the concussion, when the bullet is large and its velocity is great. Fatal hæmorrhage quickly ensues. Rupture of the spleen may also occur during convalescence.

Literature of '96-'97-'98.

Case of man who discharged 32-calibre revolver into left chest. Patient complained of pain in left hypochondrium. Eight hours after injury operation performed; ball had perforated chest and pleural cavity contained air. Splenic flexure of colon was found to be wounded in four places and the spleen was badly torn in its lower and middle portion. Openings in colon were clamped. Spleen was extirpated. Condition of patient was so critical that injured portion of colon was supported with glass tubes outside of abdomen. Patient died in short time. Death due to great hæmorrhage from splenic vessels.

Attention called to experiments of Jordan on dogs. These observations showed that removal of lower half of spleen after employment of locked ligature was comparatively safe, but excision of its upper portion was decidedly more dangerous, owing to difficulty of controlling gastric arterial anastomosing branches and other vessels, and involvement of diaphragmatic nerve-plexus. Weir (Med. Record, Apr. 23, '98).

During the War of the Rebellion the proportion of deaths was 93 per cent. In civil life, however, the weapons used are, as a rule, less powerful, and it is probable that the mortality, especially since antiseptic surgery has been generally utilized, is much smaller. The predilection of this organ for abscess greatly darkens the prospects of recovery.

Kidneys.—Complications are also to be feared in lesions of this organ,—namely, peritonitis, nephritis, and secondary hæmorrhage. Again, the position of the kidney makes it probable that other organs are also injured in the majority of cases. The direction from which the bullet or stab came, the length of the penetrating blade, etc., are important factors when the nature of the injury is to be determined.

Bladder. — Gunshot wounds of the bladder are always serious as far as complications are concerned, rectal, vaginal, perineal, and scrotal fistulæ being very frequent.

As to the mortality of penetrating wounds of the bladder, it is not so great as in lesions of any of the other abdominal organs. Stab wounds are more frequently mortal than uncomplicated bullet wounds, the proportions being 29 per cent. in the former and 17 per cent. in the latter. When, however, osseous lesions are also present, penetration or fracture of the pelvis, etc., the mortality reaches 29 per cent.

Treatment.—The preliminary measures indicated in the treatment of complicated contusions of the abdomen are also applicable in that of penetrating wounds of that cavity. Protrusion of portions of the intestines, the mesentery, and the omentum through the external wound is an early complication met with in many cases of penetrating wound. If the protruding mass be intestinal and in good condition it should at once be returned into the abdomen. An easy way of accomplishing this (recommended by Levis) is to raise the middle of the patient's body by means of a pillow, the hands, etc., while he is lying on his back. The anterior portion of the pelvis is thus separated to an abnormal degree from the anterior portion of the thorax, and the increased room in the abdominal cavity thus obtained causes the intestines to spread out, as it were, and, their weight causing traction upon the protruding loop, the latter quickly slips in. At times accumulation of gas or fæcal matter checks its inward progress; the gas can easily be let out by inserting a clean hypodermic needle into the projecting bowel; the fæcal matter can also be reduced in quantity by drawing out an additional portion of the gut—thus increasing the size of the loop—and gently pressing small portions of the contents into the unprolapsed bowel, thus diminishing the tension of the protruded mass. It is sometimes necessary to enlarge the abdominal wound. If the projecting mass be greatly inflamed the latter procedure is unavoidable. If it be gangrenous it had better be incised and the formation of a fæcal fistula permitted.

Literature of '96-'97-'98.

Punctured wound of abdomen with prolapse of eight inches of intestine in a girl aged 4 years. She was brought from the country four miles in a spring cart, with the protruded bowel covered with a wet cloth. To return the bowel, chloroform was administered and the opening enlarged. The wound then stitched up and a pad and bandage applied. Uneventful recovery. Thompson (Birmingham Med. Rev., July, '97).

An omental protrusion, if healthy, can be immediately returned, but if greatly inflamed or gangrenous it should be transfixed near the abdominal wall and tied with a double ligature; then excised. The stump is then secured in the deeper portion of the wound with ligatures and adhesive strips.

Case of stab wound of the abdomen in which it was necessary to remove one-third of the greater omentum. The patient recovered. I. E. Clark (Trans. Texas Med. Assoc., May 2, 5, '92).

Case of penetrating wound causing a strangulated hernia of the omentum. Laparotomy performed, with resection of the omentum. Recovery. Dum-Popescu (Revue Int. de Bibliographie, Aug. 25, '94).

Punctured wounds of the abdomen are frequently recovered from spontaneously, owing to the absence of serious visceral lesions. The same statement may be made as regards bullet wounds, but with less emphasis. That laparotomy should be performed in every case is a view that wide-spread clinical testimony does not sustain; but that a wound of sufficient importance to cause

anxiety be enlarged down to the peritoneum to allow of a careful examination and adequate procedures, if need be, and that laparotomy proper should be reserved for lesions which, from the nature of the symptoms, tend toward a fatal issue, is in keeping with the teachings of the most advanced, but safe, surgery.

Preliminary incision along the track of the bullet, or, in cases of need, in the median line, is the best and safest means at our disposal to recognize the presence or absence of wounds of the viscera. L. A. Stimson (N. Y. Med. Jour., Nov. 2, '89).

In penetrating gunshot wounds (1) exploratory incision should be made in the region of the wound to ascertain whether or not it be penetrating; (2) if penetrating, median laparotomy should be performed as soon as possible after the injury (unless contra-indicated by severe shock); (3) signs of peritonitis, just beginning or well developed, while diminishing the chances of success, are by no means a contra-indication for operative interference. W. B. Coley (Epitome of Medicine, Apr., '92).

The necessity for operation is to be determined by the evidence of hæmorrhage or fæcal extravasation, and in some degree by the probability of visceral injury, as shown by the size and apparent course of the missile. Peritonitis does not contra-indicate interference, although it must increase the gravity of the prognosis. Conner (Jour. Amer. Med. Assoc., Sept. 16, '93).

1. Given a wound of the abdominal wall, proof of penetration should always be sought for, in the absence of definite symptoms, by following the wound carefully down to the peritoneum. 2. Evidence of penetration having been obtained, median laparotomy should be immediately performed, or the wound enlarged to allow of a sufficient inspection of the abdominal contents, of the repair of any injury found, or of adequate cleansing of the cavity. Markoe (N. Y. Med. Jour., Dec. 17, '92).

Thirteen cases showing that laparotomy is always indicated in penetrating wounds of abdomen, even if only done for exploratory purposes. Gulotta (Riforma Medica, p. 184, '95).

Literature of '96-'97-'98.

The wound of entrance should be enlarged, and, if the missile has entered the abdomen, a section is called for. Operation is proper soon after the injury, before the peritoneal membrane has become infected or much blood lost. Tiffany (Amer. Jour. Med. Sci., May, '96).

Hyperæsthesia of the abdomen is an indication for operation. An increase in the respirations to twenty-eight or thirty per minute is an absolute indication for operating. Cold extremities are also significant. Le Dentu (Le Progrès Méd., Oct. 27, '97).

When surgical measures become necessary, including enlargement of the wound, the patient should be placed under an anæsthetic. The rectum should be emptied by copious injections containing a tablespoonful of glycerin to the pint. A subcutaneous injection of morphia (¼ grain) is recommended by many surgeons. If, however, there is a tendency to shock without much pain, this agent had better be withheld. Rectal injections of whisky and warm water, 2 ounces of the former and 4 of the latter, is useful to sustain cardiac action. It may be repeated in an hour if evidences of impending shock are still present.

If, after a careful examination of the enlarged wound, it is found that the peritoneum is not involved, the exposed tissues are carefully cleansed and the wound is closed, deep sutures being used to hold the tissues in accurate apposition. As already stated, the possibility of ventral hernia should be borne in mind; the patient should be kept in bed for some time and a bandage be

worn until all local weakness has disappeared.

If, after a stab wound, the parietal peritoneum alone is found incised or penetrated and there is no evidence that the organs behind have suffered injury, the tissues must be cleansed with great care and the peritoneal flaps brought together, the serous surfaces being kept in contact. A continuous catgut suture is used for the peritoneum; the muscles and skin are then united and the wound is closed. The measures already outlined to prevent ventral hernia are also indicated for the deeper wound.

Literature of '96-'97-'98.

The surgeon, when confronted with gunshot wounds penetrating the abdomen, ought immediately to perform laparotomy and look out for the various perforations of the viscera to see if he can close them, without waiting till peritonitis arises to force his hand. Chauvel (Lancet, Oct. 2, '97).

When laparotomy becomes necessary the incision should be made in a spot affording the operator the greatest opportunity for a wide field of action, and should be sufficiently long. When performed for the arrest of dangerous hæmorrhage, a long median incision will enable the surgeon to reach any organ with ease,—an important factor, for the missile or blade inflicting the injury may have traversed harmlessly between several coils of intestine and have caused a rent in the organ most remote from the point of entrance. Again, the incision should be free, so as to make it possible to easily reach all parts of the abdomen to allow of a thorough removal of all extravasations which might otherwise ultimately cause complications.

Case ending fatally through the fact that a too limited parietal incision had been made. A longer incision would have permitted more extensive irrigation and prevented peritonitis, which developed in the upper portion of the abdomen. Dubujadoux (Archives de Méd. et de Pharm. Militaires, Aug., '95).

The stomach and the transverse colon are best brought to view by an incision in the linea alba. In the case of the stomach hernia of the mucous membrane will facilitate recognition of the lesion. The ascending colon requires lateral incision on the right side, and the descending on the left. These also should be sufficiently long to facilitate the search for the injury or injuries that may be present in the organ itself and beyond.

The incision may be such as to intersect the wound of entrance. This is desirable at all times, the aim being, of course, to always avoid unnecessary solutions of continuity. Such an incision can fortunately be made in many of the cases in which the hæmorrhage is not formidable.

Hæmorrhage.—When the abdominal cavity is opened and the hæmorrhage, which is usually more venous than arterial, is marked, the blood rapidly accumulates in the most depressed portion of the cavity from an invisible source. To mop out the blood with sponges is generally recommended; but such a procedure does not cause the hæmorrhage to cease,—the first *desideratum.* In these formidable cases an assistant should at once introduce his hand through the wound—hence the advisability of a long incision—and compress the abdominal aorta below the diaphragm. This procedure immediately checks the flow. Carefully-cleansed and disinfected sponges having been made ready in the meantime, the blood present is quickly, but not roughly, sponged out. When this is finished the source of hæmorrhage is sought after.

If any difficulty is experienced, the digital pressure upon the aorta may, for an instant, be decreased, and a sudden gush will point to at least the direction from which the blood comes. The necessary steps are then taken to arrest the flow, and the abdominal aorta is released as soon as possible,—not suddenly, but by a gradual reduction of pressure.

The measures to be adapted in arresting hæmorrhage vary according to the organ involved. Gunshot wounds of the liver are frequently stellate, and rents, radiating from the bullet-track in various directions, greatly increase the bleeding surface, the parenchyma in this organ taking part to a great degree in the emission of blood. To force resilient sponges into these tears is to increase their depth. If the wound be not very extensive, it may be sutured with catgut or cauterized with the actual cautery. If the wound is extensive it had better be packed with long strips of iodoform gauze, one end of which is brought out of the external wound.

Gunshot wound of the liver. Flushing with half-sterilized water to stop hæmorrhage. The liver-wound tamponed with a long stick of iodoform gauze, bringing the strip out through the abdominal incision, leaving one suture untied. On the second day gauze tampon withdrawn and the suture tied. No shock. Recovery and free from any discomfort. John A. Lewis (Amer. Pract. and News, Nov. 30, '95).

Literature of '96-'97-'98.

Hæmorrhage from liver in case arrested by gauze-packing, and proved quite as effectual as deep sutures could have done, while it afforded an exit from the bile, which subsequently flowed in great quantity. The gauze was not removed for nearly a week, by which time an excellent track of lymph had been formed from the liver to the abdominal wound. Gauze-packing in liver-wounds is safer than suture. L. M. Tiffany (Amer. Jour. Med. Sci., May, '96).

Five cases of wounds of liver: two by fire-arms and three by a cutting instrument. Two great dangers are hæmorrhage and infection. Immediately after accident, if there is indication of internal hæmorrhage, exploratory laparotomy should be performed. For control of hæmorrhage tampon may be utilized in grave cases, where work must be done quickly. Suture is method of election. Statistics show, out of 50 cases of operative interferenee in hepatic wounds, 36 resulted in a eure and 14 ended fatally. L. Walton (Amer. Medico-Surg. Bull., Jan. 10, '98).

The spleen is next in order as to profuseness of hæmorrhage. The same procedures may be adopted as for the liver, but the introduction of iodoform strips is to be preferred. If these means fail, splenectomy is the only measure left. Sometimes a portion of the organ projects through the wound; removal of the protruding portion should be practiced after passing a ligature around the mass.

Literature of '96-'97-'98.

Case of prolapse of spleen through a perforating wound of the abdomen of three weeks' standing. Spleen at first considered to be the liver, though on the left side, on account of the size, shape, and color of the organ. Attempts to reduce it failed. It slowly contracted, becoming, within a month, less, by half, in size, and contracted very firm adhesions to the skin, the peritoneal cavity, meanwhile, being completely shut off. As there had been a compound fracture of the tenth rib, with subsequent necrosis of the broken ends of the bone, a sinus remained, leading from the prolapsed organ to the bone; and here the adhesions were very vascular. The pleura had escaped uninjured. Splenectomy. Uneventful recovery. E. Harold Brown (Brit. Med. Jour., Jan. 16, '97).

The walls of the stomach and intestines may also give rise to marked

hæmorrhage notwithstanding their comparative thinness. The number of vessels coursing through them, however, is very great. In these cases it is best to hem the margins of the wounds with fine silk. The bladder may be treated in the same way.

The mesentery sometimes bleeds profusely when perforated. The mesenteric vessels should be ligated *en masse* with fine silk.

Hæmorrhage of the kidney is arrested in the majority of cases by iodoform-gauze package. If this should prove ineffectual the organ must be exposed and the vessels tied if possible. If not, nephrotomy or nephrectomy should be resorted to. The latter operation does away with the chances of complication attending the former, while the kidney of the other side assumes the function of both.

Perforation.—To detect the presence of a perforation and its location, Senn's hydrogen test, already mentioned, may be employed.

> Insufflation of hydrogen, after the abdomen is opened, a valuable accessory in locating wounds and making sure that all are closed. A. T. Cabot (Boston Med. and Surg. Jour., July 25, '89).
>
> Senn's method of hydrogen-gas insufflation, however admissible in recent cases, should be used with great caution after the lapse of a few hours. The distention and motion of the intestines caused by the insufflation might rupture inflammatory adhesions, burst open intestinal wounds that had nearly healed, and make a peritonitis general which had become circumscribed. McGraw (Trans. Amer. Surg. Assoc., vol. vii, '89).

When perforations exist in the stomach or the intestines, the gas is, of course, introduced through the mouth in the former case and by the rectum in the latter. When several perforations of the intestine are present, the hydrogen escapes by the opening nearest the nozzle of the instrument. The laceration thus indicated being closed, the test is employed again and the second perforation is closed, this being repeated until no evidence that the gas is escaping from the intestinal tract is afforded.

The fact that the intestines are, at times, perforated in twenty spots by a bullet suggests the considerable degree of care that should be given to this part of the procedure, which is carried out in the following way: The perforation nearest the rectum having been detected, the portion of intestine perforated is gently brought into full view. An assistant causes the gas in the portion of gut below the laceration to escape through the latter by slight pressure. This being done, the next step is to ascertain whether there is another perforation above. A fresh, perfectly aseptic glass tube is placed at the end of the insufflating tube and introduced into the wound with the tip directed away from the rectum. The assistant now being directed to compress the intestine below the perforation, a small amount of gas blown above the latter will inflate the upper segment if there is no opening, or indicate the location of the perforation if there is one. As soon as the latter is detected, the tube is withdrawn, the neighboring intestine on each side of the first perforation is disinfected, and the opening is closed. This procedure is renewed until all perforations have been found and closed. This plan renders unnecessary the removal of the intestines from the abdominal cavity during any part of the operation, the source of complications in many cases, and of death by aggravated shock in others, and is now recommended by the majority of American surgeons.

There is great ground for the objection to Senn's method, made by many surgeons, as regards its use for purposes of diagnosis prior to laparotomy, but, in the detection of perforations after the abdomen has been opened, it is of value, and may be used, at times, to great advantage.

The manner of closing the wound is that indicated for lacerations following blows. The stomach and intestinal perforations being treated in the same way, the margins of the wound are turned inward and the serous surfaces are united by a continuous, fine-silk Lembert suture or by interrupted sutures, including the serous and muscular coats and the submucosa. These are cut short and left in, being eventually discharged *per anum*.

> Recoveries could be produced in every case if the operator closed the punctured gut by means of sutures to the side of a healthy loop. If the perforation is double, another loop should be placed upon the other side. Union is rapid, firm, and secure. Chaput (La Semaine Médicale, p. 436, '91).

At times the tissues around a perforation are sufficiently contused to render an omental graft necessary.

Enterectomy is sometimes required, and not infrequently exsections of the intestine are necessary. In that case the intervening portion, if it is not too long, had better be resected, thus avoiding a double operation in the continuity of the gut.

> Case with six intestinal perforations and wound in bladder 4 centimetres long. Resection of 62 centimetres of small intestine. Slight cystitis; recovery uneventful. Rieder (Le Bull. Méd., Jan. 3, '95).

After the active measures described have been carried out the extravasation of the contents of the stomach or intestines may make it necessary to flush the peritoneal cavity. Warm, sterilized water should be used, but care should be taken not to handle the intestines roughly. By turning the patient on his side the fluid is poured out. The abdominal cavity is then dried with large sponges wrung out of warm, sterilized water. Chilling of the viscera should be carefully avoided, and the parts should be exposed to the air as short a time as possible.

> Irrigation of the peritoneal cavity is not proper in cases in which the local septic processes already exist, but when the case is seen early and the septic process has not started. The object is to remove clotted blood, fæcal matter, etc., and for this purpose there is nothing better than irrigation with a bland solution. Cabot (Boston Med. and Surg. Jour., July 25, '95).
>
> Flushing of the abdomen, when presumably it is infected, increases the likelihood of spreading the infectious process to remote regions; wiping out the cavity is to be preferred. J. W. Elliot (Boston Med. and Surg. Jour., July 25, '95).
>
> If really septic material has been introduced in the abdomen, washing out does not save patient. The principal advantage of irrigation is to remove matter, small clots, etc., which may decompose. Cushing (Boston Med. and Surg. Jour., July 25, '95).
>
> Thorough irrigation and temporary drainage should be employed whenever much soiling of the peritoneum has occurred or is likely to follow, or when there are evidences of beginning inflammation. Statistical list of fifty-four cases with a mortality of 15 per cent. F. H. Markoe (N. Y. Med. Jour., Dec. 17, '92).

Literature of '96-'97-'98.

Flushing the open peritoneal cavity with hot water or hot, normal, salt solution is an excellent stimulant to the heart. The abdominal wound should be closed when practicable without drain-

age. L. M. Tiffany (Amer. Jour. Med. Sci., May, '96).

Case of successful result of the closure of sixteen perforations of the intestine and use of the Murphy button. Two factors which contributed very largely to this result: the very liberal use of hot, sterile, normal, salt solution for cleansing, and the fact that the patient had eaten nothing for twenty-four hours previous to being shot. George Woolsey (Annals of Surg., Apr., '96).

Case of stab wound illustrating the value of salt solution. Within the abdomen, where only salt solution was used, no inflammation or trouble followed; whereas at the abdominal wound, where bichloride, etc., were used, suppuration took place. P. R. Bolton (Med. Record, July 31, '97).

Drainage is sometimes necessary, especially for wounds of the solid viscera, such as the liver, spleen, kidneys, etc., in which active measures were not resorted to early.

Literature of '96-'97-'98.

Severe case in which peritonitis ensued. Recovery attributed to the free irrigation of the peritoneal cavity with hot water and to the thorough drainage. The irrigation checked the bleeding from the rent in the liver, and removed a vast amount of effused blood and lymph from the peritoneum. The drainage-tube—properly used—is itself an excellent hæmostatic. By draining away the blood as soon as it was poured out it promoted the natural arrest of hæmorrhage. Furthermore, the removal of the effused blood, lymph, and bile checked the progress of peritonitis, and prevented its further development. Christopher Martin (Birmingham Med. Review, May, '97).

Case of successful operation after attempt at disemboweling in a man aged 40. Transverse wound was present eight or nine inches long, just above umbilicus. Protruding from this were transverse colon, omentum, and small intestines; fifteen inches of latter were severed from their mesenteric attachment, and stripped of peritoneal covering. Wound was enlarged vertically, and bleeding mesenteric vessels secured; clots removed, and parts flushed with hot distilled water. Eighteen inches of denuded intestine were removed and gut united by end-to-end anastomosis by means of Murphy's button. Mesentery was united by catgut sutures, wound closed, and a two-way glass drainage-tube inserted. Rectal feeding used for forty-eight hours, then small quantities of peptonized milk by mouth. Tube was removed on second day; on eighteenth day button passed. Patient made good recovery. R. H. Harte (Annals of Surg., June, '98).

In abdominal surgery the weight of evidence stands in favor of dispensing with drainage whenever it is possible. Method of closing abdominal wound layer by layer has greatest number of advocates, and materials mostly used for sutures are catgut, chromicized catgut, silk-worm gut, and silver wire. Causes of post-operative wound-infection are unnecessary manifestations of wound, rough retraction of its edges and prolonged pressure with metal retractors, imperfect hæmostases, strangulation of large bits of tissue by ligatures, and undue tension of the sutures. A. C. Heffenger (Med. Record, Dec. 17, '98).

To summarize: we will say that immediate exploration of the abdominal cavity is indicated as soon as it is suspected to have been penetrated or in any way injured by a traumatism. The injury to its contents must then be repaired under strict aseptic precautions.

Should no lesion be found, the mere exploration should result in no serious damage.

After-treatment. — Food should be withheld for thirty-six hours, but a little water and brandy, in teaspoonful doses, may be allowed, especially if there is any degree of shock. In that case it is advisable also to use stimulants by the rectum or subcutaneously. Nutritive

enemata of beef-tea and milk are necessary to sustain the patient's powers.

In three cases that recovered one had 16 wounds of the small intestine; one, 14, and another, 10, and it would seem almost impossible to imagine that recovery could have taken place in these cases without operation. The after-treatment is regarded as all-important. During the first twenty-four hours only cracked ice was allowed and stimulants. On the second day the patients were fed with chicken-broth at intervals of two to four hours. Rectal feeding with predigested foods and alcohol was practiced. A. B. Miles (Annals of Surg., Dec., '93).

The bowels should be kept freely movable. Large doses of Epsom salts sometimes serve to thwart the danger of peritonitis, without compromising the intestinal wounds, by removing all noxious material that may have accumulated in the bowel.

Liquid food may be permitted by the evening of the second day, and soft, easily-digested food after a week, rectal alimentation being continued until then.

The sutures can be removed on the ninth day. The closure of the external wound must be complete before the patient can be allowed to leave his bed, and the danger of a ventral hernia should be counteracted by means of an abdominal supporter.

Hypodermic injections of strychnia, $^1/_{60}$ to $^1/_{30}$ grain, three times a day, according to indications, will prove most effectual in maintaining the strength of the patient and toning the muscular wall of the intestine.

Literature of '96-'97-'98.

Case of gunshot wound of the abdomen. The ball had passed through the small bowel in from fifteen to twenty places. About one and one-half hours necessary to close the several openings. The patient became very weak; so that the remainder of the operation had to be hastily performed. Strychnia, hypodermically, and 32 ounces of a saline solution injected into the thigh, seemed to very materially improve his condition. Second day part of the gauze drainage removed, and the next morning the external opening closed. Small quantities of hot water allowed on the morning of the third day, and on the fourth, light liquid diet. Recovery smooth and rapid. James Donnelly (Toledo Med. and Surg. Reporter, Mar., '96).

Wounds Due to Military Fire-arms.

[See *supra*, PENETRATING WOUNDS, for details.]

During the Franco-Prussian War German soldiers were frequently found suffering from wounds of so frightful a nature that the French were accused of using explosive bullets contrary to the International Convention to that effect. Wounded limbs showed lesions of so destructive a character that the hole made was a *magma* of muscle, tendon, bone, blood, etc. Dead subjects were found with their heads completely shattered, the brains being scattered on all sides. The good faith of the French was soon demonstrated, however, experiments having shown that their rifle, the Chassepot, was capable, when fired at close quarters, of creating unusual lesions on account of the initial velocity and the greater rotation of the bullet. This was attributed mainly to the reduced diameter of the bore, 11 millimetres, and to the increased quantity of powder used.

In 1886 France adopted 8 millimetres as the calibre of her military arm, and the other nations soon followed her example. The United States Government adopted two calibres, one of 7.62 millimetres for the army, and one of 6 millimetres for the navy. Contrary to all expectations, the effects noted in recent wars, the war between Chili and Peru, in which a 7.6-millimetre calibre was

used; that between China and Japan, in which a 7.9-millimetre was used on the Japanese side, and the more recent Chitral expeditions and Abyssinian campaigns, in which 7.9-millimetre and 6.5 millimetre arms, respectively, were employed, were less destructive than the larger calibres, while the wounds caused by them healed with greater rapidity than those following lesion due to the action of larger balls. During the Chilian War there were instances where men completely perforated through the chest would suffer from slight shock, a slight hæmoptysis, and soon be out.

Literature of '96-'97-'98.

Two cases in soldiers wounded during the war between Greece and Turkey, the bullets having passed through the body in an antero-posterior direction at or above the level of the umbilicus. Recovery without laparotomy.

Case rapidly recovering under expectant treatment from a wound of the chest and liver from which bile escaped for several days at first. N. Senn (Jour. of the Amer. Med. Assoc., vol. xxiv, '97).

This radical difference between the destructive power of large and small calibres, or, rather, between the destructive effects of an arm such as the Chassepot (11 millimetres) and the modern rifle (6 to 8 millimetres), is mainly attributed to the fact that lead was formerly employed in the manufacture of bullets: whereas, at present, in order to avoid destruction of the bullet during its progress through the barrel, resulting from the great increase of the powder-charge, and with the view of reducing the weight carried by the soldier, owing to the introduction of repeating arms, the bullet itself is either made of some hard metal. or it is covered with some such substance as nickel, steel, German silver, etc.

These physical features, added to the smaller diameter of the projectile, the much greater velocity with which it travels, its more or less pointed tip, causes it to penetrate soft tissues as would a long, thin blade, separating rather than destroying them. Therefore perforations in a muscle are clean-cut; at times their walls are even collapsed; as a rule, the channel is about the size of the bullet; large blood-vessels are severed and bleed until the heart ceases to beat, etc.

Literature of '96-'97-'98.

The general conclusions which can be drawn on this matter are that the flesh wounds inflicted by these small-calibre bullets resemble more closely incised rather than lacerated wounds. Editorial (Practitioner, Sept., '97).

Experiments on dead bodies seemed to show that very different effects were to be expected as soon as any resistance was offered to the passage of the bullet. When the skull was struck even at long range (1100 metres, Kocher), for instance, the brain was completely disorganized and the skull was fractured in all directions, while at short range explosion of the head might be said to have taken place. But experiments on dead bodies are now known to furnish but little accurate information as regards the effect of projectiles, the living tissues being affected differently. At short range destructive effects on soft and hard tissues are produced, but these do not vary from those by older weapons at equal distances.

Case of a convict who, while trying to escape, was shot through the head with the new Krãg-Jorgensen rifle. The skull was shattered and the brain completely disorganized. The distance was about ninety feet. Girard (Jour. of the Amer. Med. Assoc., Oct. 19, '95).

Experiments on live dogs with bullets

of higher velocity employed in modern armies: In the five cases in which a large dog was employed, the animal died instantly when struck, without uttering a single cry. The muscular tissues for nearly two inches on all sides of the bullet-track seemed absolutely destroyed; a wound of the liver was of a stellate character, with fissures radiating in every direction. The intestinal wounds of entrance and exit were much larger than the bullet. At one hundred yards the abdomen, when opened, looked as if an explosion had taken place within it, and a section of gut twelve inches long was completely severed, mesentery and all. Wherever a vessel was struck the opening was clean-cut, as with a knife, without any curling up of the inner coat; so that hæmorrhage would cease only with the stoppage of the heart-beat. J. D. Griffith (Kansas City Med. Index, Feb., '94).

Accepting only as evidence that furnished by the use of small-calibre bullets on the living, it may be said that the arms now furnished to armies do not give rise to injuries such as those met with in civil life, when weapons of various kinds, imparting to bullets a much smaller velocity, are used.

Effects of Lee-Metford rifle in twenty cases, including several bone-injuries: All the latter healed rapidly, one man shot through the sacrum being on duty again three weeks later. Bones struck without serious fracture: Ulna, 2; humerus, 2; radius, 3; fibula, 1; tibia, 2; femur, 1. Healing extremely rapid in all cases. Gould (Brit. Med. Jour., July 20, '95).

In the Chitral expedition the wounds through the soft tissues at both short and long ranges were clean and incised, with little or no bruising, and healed rapidly. The bones showed no explosive action; the bullet-holes were punched out and showed but little splintering. The wounds caused by the large-bore bullets of the enemy were much more severe. Sir William MacCormac (Lancet, Aug. 3, '95).

Literature of '96-'97-'98.

In the Chitral campaign, according to General Lowe, prisoners were often brought in with two or three bullet-holes through them that seemed to cause the wounded men but little inconvenience, for they had been marched six to seven miles before reaching the bivouac.

Case of a spy who, at execution, received six bullets at fifteen paces, three missiles piercing his chest. On being unbound, he ran a quarter of a mile, where he was sabered to death by a mounted Sikh.

In the recent fighting in South Africa the British troops were unable by their rifles alone to stop the onward rush of the natives, and it was only the opportune assistance of the machine-guns that saved them from being overcome by the savages.

In Abyssinia the disabling effect of the Mannlicher-Carcano rifle of 6.5 millimetres, with which the Italians were armed, was so slight that it was thought that the ammunition might have been tampered with; and the natives overcame the Italians, with the most frightful slaughter.

Conclusion that the destructive power of the small-calibre arm has been overestimated; that its stopping or disabled power is less than that of larger calibres; that wounds in future conflicts will, as a rule, be less severe, and will heal more rapidly with fewer complications than has been the case in the past. Consequently less radical treatment will be required, and conservative treatment will be followed by the most brilliant results. Gwilym G. Davis (Annals of Surg., Jan., '97).

It is evident, judging by the practical evidence at present at our disposal, that military gunshot wounds cannot be considered absolutely as belonging to the category reviewed in this article. But it is only a question of degree as to the injuries inflicted, and the military surgeon, by exercising his usual powers of discernment, will find a larger number of curable cases, whenever the severe

hæmorrhages frequently attending the use of these new weapons will not have caused death soon after the receipt of the injury.

> Conservatism will be a characteristic of the coming days of military surgery. The two great dangers, hæmorrhage and infection, will be wonderfully diminished. Mutilating primary operations will be limited to injuries which extensively destroy the soft parts, and complications of large vessels and nerves which are in themselves severe enough to arrest nutrition in a limb. Gunshot injuries of bones and joints will no longer render primary resection or amputation imperatively necessary, and the danger of wounds which penetrate cavities will be greatly lessened. Prompt and efficient aid to the injured is the first essential of battle-field surgery, and it can be achieved only by means of a well-trained hospital corps, which must be intrusted largely to the educated non-combatant soldier. Senn (Jour. of the Amer. Med. Assoc., July 6, '95).

Our recent campaign has but verified the teachings just outlined.

ERNEST LAPLACE,
Philadelphia.

ABDOMINAL ANEURISM. See ANEURISM.

ABORTION.

Definition.—Abortion is a term used to denote the expulsion of the product of conception, alive or dead, during the first six months of pregnancy; or, more exactly, the expulsion of a product of pregnancy which has not yet attained the period of viability, thus including cases where the fœtus may perish during the sixth month of pregnancy and be delivered a month or so later.

A number of authorities, especially American and English, only apply the term "abortion" to expulsion of the ovum during the first three months, while "immature delivery" and "miscarriage" are applied to expulsion of the product of conception from the end of the third month to that of the seventh, —*i.e.*, from the formation of the placenta to the time the child becomes viable. When the expulsion takes place between the period of viability and the normal term of pregnancy, it is called "premature delivery."

Frequency.—It is difficult to ascertain the frequency of abortion (1) because during the first two months of pregnancy it often occurs without being detected; (2) because, when known and even when occurring at a late date, it is frequently allowed to go without treatment.

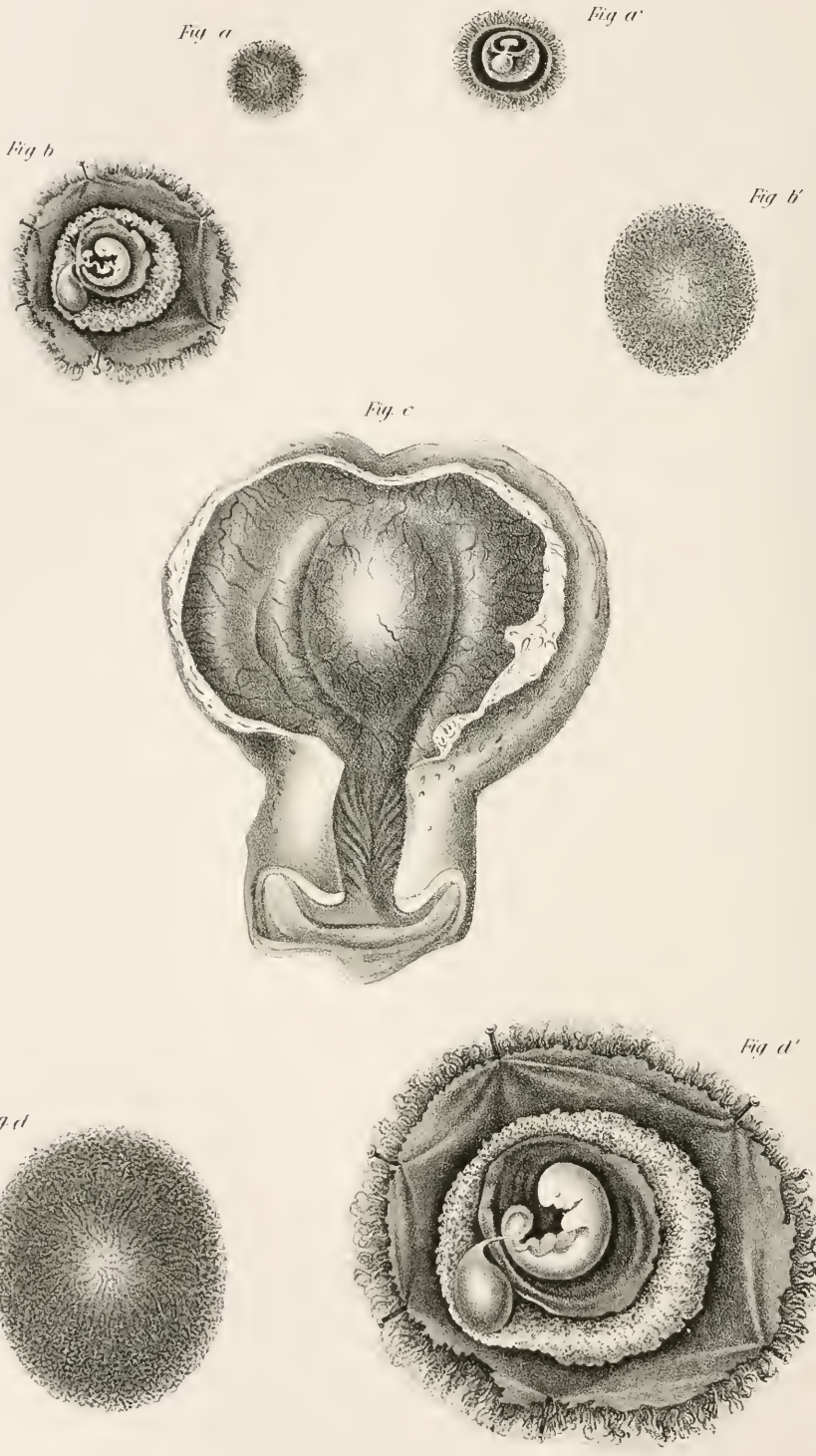
The statistics obtained in maternities give a proportion of one abortion to three normal pregnancies; but such a proportion cannot be accepted as a rule, lying-in hospitals receiving only women in an advanced state of pregnancy. It is generally admitted that spontaneous abortion occurs most frequently during the first three months of pregnancy.

Literature of '96-'97-'98.

> Study of 275 cases of abortion which occurred at the Lariboisière Maternity, of Paris, during the last two years. In almost all of the cases the miscarriage took place during the third and fourth months. Maygrier (L'Obstétrique, July, '97).

Viability.—Until recently the fœtus was clinically looked upon as viable only after the seventh month; but more careful treatment—above all, the use of the incubator and of artificial feeding by means of the stomach-tube—has caused children born during the sixth month to be looked upon, clinically, as well as legally, as viable.

> A very young fœtus may breathe after delivery This occurred in three cases



Development of the ovum. (Caseaux, Hunter, Erdl, &c.)

Figures a and b The ovum during the second and fourth week. Figure c. Section of the uterus (reduced) showing the thickened mucous membrane which is to furnish the decidua vera. Figures d and d' The ovum at the end of the sixth week

in the fifteenth, fifteenth, and nineteenth weeks, respectively. In the first of these there were six respiratory movements before and five after severing the cord, the fœtus living one hour. In the second case the fœtus lived an hour and a half and breathed five times. The third fœtus lived but half an hour and breathed eight times. The autopsy showed the presence of air in the stomach, but the lungs were empty. Glöckner (Cent. f. Gyn., No. 1, '90).

Symptoms.—Abortion is divided as to its symptomatology by the majority of obstetricians into four classes:—

1. Abortion occurring during the first month.

2. Abortion occurring during the second month.

3. Abortion occurring between the beginning of the third month and the end of the fourth month.

4. Abortion occurring during the fifth and sixth months.

After the third month the abortion presents very distinct clinical characters.

Abortion in general is usually preceded by dysmenorrhœal pains, extending as far as the loins, and a sensation of bearing down in the pelvis, or contractions of the uterus with or without hæmorrhage.

When the death of the fœtus precedes the abortion, the uterus ceases to increase in size, and all reflex symptoms caused by pregnancy disappear.

Abortion During the First Month.—This usually gives rise to symptoms simulating those of retarded menstruation. Slight pains in the back in the region of the uterus are complained of; the symptoms, in this particular, resemble those of normal labor, but are very much less marked. Blood, blood-clots, and flakes of the mucous membrane of the uterus are gradually expelled during several days. The ovum is expelled entire, but it is so small that it is rarely discovered.

Abortion During the Second Month.—Inasmuch as the uterus has decidedly increased in size as compared to the first month, the contractions and pains are proportionately stronger. The embryo is usually expelled inclosed in the unbroken membranes. Sometimes, however, the latter are ruptured.

The embryo and membranes may be detached from the uterus in two ways:

(*a*) By hæmorrhage between the membranes and the uterus, followed by uterine contraction.

(*b*) By contractions of the uterus, followed by hæmorrhage. In the latter case the abortion is more prolonged, the membranes being detached but slowly from the uterus.

If the embryo be still living, the abortion lasts longer, and the hæmorrhage is greater. If the embryo be dead, the whole is usually expelled like a foreign body, and without rupture of the membranes.

[Great importance has been attached to the fact that during the first three months of gestation the spontaneous abortion takes place *without rupture of the membranes*. When the ovum is broken and the embryo is expelled before the membranes, a suspicion of criminal abortion arises. The opinion of legal physicians has been strongly expressed in that sense. However, it must be borne in mind that some diseases of the ovum (syphilis, etc.) might produce the rupture of the membranes before the third month. A. Lutaud.]

Examination of the uterus will show that it is increased in volume, and situated lower down in the pelvis than normally. The cervix is dilated, softened, and filled with blood-clots. The dilatation is more marked in multiparæ than in primiparæ.

The cervix, though dilated, does not

become effaced; and the embryo contained in the unruptured membranes may pass through the cervix and be expelled. If the membranes are ruptured, however, the embryo passes by itself, the very thin umbilical cord breaks, and the cervix closes. The membranes are, in this latter case, expelled later on. The membranes are ruptured about once in every two cases.

Abortion from the Beginning of the Third to the End of the Fourth Month.—This occurs nearly always in two stages, the first consisting in the expulsion of the fœtus, and the second in the expulsion of the membranes and placenta.

The cervix in this form of abortion tends to diminish in length. The uterine contractions act more powerfully than in the previous forms of abortion. Under their influence the membranes are ruptured and the fœtus is expelled.

The placenta may still be adherent; the cervix then closes again, and the placenta and membranes are expelled later on. Hæmorrhage is likely to accompany the delivery of the placenta and membranes, especially when the former is only partly detached. Under these circumstances each uterine contraction is accompanied by hæmorrhage.

The placenta may be already detached when the fœtus is expelled; in such a case it is likely to be expelled immediately after the latter, before the cervix closes, but part of the decidua may remain in the uterus after delivery of the placenta. This occurs most frequently when the fœtus is dead.

Statistics show that retention of the placenta occurs most frequently during this period.

> At three months the placental form is well established, and the uterine contents behave much as they do at full term, with these differences: the placenta is less firmly put together and is more firmly united to the uterus. There is danger, therefore, of masses of placenta being retained, even though much may be expelled. Ayers (N. Y. Med. Record, Sept. 28, '95).

Abortion During the Fifth and Sixth Months.—The fœtus and placenta are almost always expelled separately. Uterine contraction is more marked; the cervix tends to become more effaced and to dilate.

Delivery of the placenta usually follows delivery of the fœtus rapidly, and the tendency to hæmorrhage is less marked than in the previous forms of abortion.

Of 501 cases of abortion analyzed by Varnier and Brion, the fœtus, or embryo, and the placenta were expelled separately in 453, and together in 48 cases. When the delivery occurred in two stages, the time found to elapse between the expulsion of the fœtus and that of the placenta was as follows: 120 cases, within 15 minutes; 81 cases, from 15 to 30 minutes; 78 cases, from 30 to 60 minutes; 83 cases, from 1 to 4 hours.

Literature of '96-'97-'98.

> In 275 cases treated in the last two years of those cases terminating naturally expulsion of the whole ovum occurred in hospital in 145 cases. The remaining 39 were admitted with the placenta partially or entirely retained. Complete expulsion occurred after a period varying from a few hours to three days as a maximum. During this time rigorous antiseptic precautions were observed (douches, etc.). All these cases terminated favorably with two exceptions: one patient was septic on admission, and died of septicæmia; the other case died of pulmonary tuberculosis. Maygrier (L'Obstétrique, July, '97).

Whenever the placenta and membranes are not expelled within four hours after the expulsion of the fœtus,

or embryo, there is retention of the membranes and placenta.

Abortion may take place suddenly, or resemble, in that particular, the irregular periodicity of normal labor, with more or less hæmorrhage. It may, indeed, last several days, owing to weakness of the uterine contractions or adhesions to the uterus or retention in the cervix of the masses to be expelled. (Rokitansky, Schülein.)

Sudden or rapid abortion is frequent during the first two months; when the expulsion takes place after the third month it generally presents the characters of normal delivery.

Pathology. — Abortion comprises a period of uterine dilatation, the expulsion of the ovum, and involution of the uterus; when delay occurs in any one of these three stages the abortion is protracted. The most frequent cause is failure of the os and cervix to dilate, resulting from a rigid condition of the tissues following laceration or previous inflammation. The internal os may be closed and the external os and cervix dilated, or the external os may be closed while the internal is dilated. The muscular wall of the lower portion of the uterus is thinned in abortion, so as to give a lower segment, which is as well marked in the aborting uterus as in the uterus in labor at full term. The peritoneum over this part of the uterus becomes loosened, as the result of the expansion of the muscular wall; and the decidua over the same area is also separated from the same cause. (Berry Hart.)

Complications.

Retention of the Secundines.— This is the most frequent complication of abortion, spontaneous or criminal, and may present either of the following characters: The placenta is non-adherent, but remains within the uterine cavity until finally expelled, either entire, or in pieces. As infection easily occurs in such a case, great attention should be paid to the temperature. The placenta remains completely adherent. When this is the case the placenta is expelled only some days later, as late even as thirty days after delivery of the fœtus.

> [According to some authors, the placenta may be absorbed and no expulsion occur. This opinion cannot any longer be admitted. When the placenta remains for years in the uterine cavity without producing alarming symptoms it is likely to become transformed into a mole. A. Lutaud.]

The placenta is partly adherent and partly non-adherent. This is the most dangerous condition, as it is the most liable to be accompanied by hæmorrhage or septicæmia. Great care should be taken in such a case not to pull on the placenta, lest more hæmorrhage be produced by further detachment.

> Septicæmia is much more likely to follow the retention of the placenta of a three months' fœtus than one of four months. Démelin (Revue Gén. de Clin. et de Thér., June 6, '89).
>
> An entire placenta in the uterus is not dangerous, but fragments rapidly give rise to grave symptoms. Bureau (Jour. de Méd., Apr. 3, '92).
>
> Case of retention of the placenta for five months after an abortion occurring at three months. Hæmorrhage continued after the abortion, and to control it ergot was given. After five months of this treatment the placenta was expelled. Elbert Wing (Chicago Med. Jour. and Exam., June, '88).

Hæmorrhage.—Hæmorrhage may occur during the detachment of the ovum itself, during the detachment of the placenta immediately after delivery of the fœtus, or during detachment of the placenta, the latter occurring several days after delivery of the fœtus.

The blood may be normal and be at once expelled from the genital organs; or it may form a half-coagulated mass within the vagina. Masses of fibrin in the blood should be diagnosed from the ovum itself, for which they may be mistaken.

The symptoms are those of all forms of hæmorrhage. When profuse there is a weak pulse, pallor, disturbances of hearing and sight, and vertigo.

The danger from the hæmorrhage is not so great as the general symptoms would often indicate; still, any serious loss might diminish resistance to infection.

Cases of hæmorrhage before miscarriage, indicating the advisability of rapidly bringing the abortion to an end when the loss of blood is serious. Martin (N. Y. Med. Jour., Feb., '92); Blood (Chicago Med. Times, Aug., '92); Hirst (Amer. Gyn. Jour., Feb., '92).

Inversion of the Uterus.—Inversion of the uterus is occasionally observed as a complication. The uterine wall should be handled with care when efforts at reduction are made, pressure with finger-tips being avoided.

Literature of '96-'97-'98.

Case of a woman, aged 36, who had four normal labors—and aborted at fifth month, followed by excessive hæmorrhage and inversion of uterus. Attempts at reduction under anæsthesia failed, but produced extensive laceration in the anterior cervical wall. Incision (after Küstner) was made through posterior uterine wall, allowing fundus to be easily reinverted. Uterus was then brought into vagina, through the opening into the posterior fornix, and wound on posterior wall suturing with sublimate catgut.

Before beginning manual reposition one should ascertain the condition of the cervical wall, as, on account of thinness from muscular degeneration, it is apt to tear. Switalski (Centralb. f. Gynäk., No. 3, '98).

But one case of inversion of uterus met with in 190,000 labors at Rotunda Hospital; 250,000 births were recorded in Vienna without a case. Case of patient who had three living children, but during fifteen months preceding entrance into hospital she had miscarried four times between third and fourth month. On fifth day following last miscarriage she flowed freely, with sudden pain in abdomen, attended with collapse. She remained in bed six weeks. Two days after getting up she felt that something came down and endeavored to keep it back with a cloth. Examination detected inversion of uterus. The mucous membrane of uterus showed no tendency to become dry and skin-like. Several days later uterus menstruated, which lasted four days. Under ether, reduction was accomplished only by making free incisions into the cervix and longitudinal incisions over uterine mucous membrane at region of internal os, in addition to continued pressure kept up on neck of swelling and over its surface. Patient subsequently became pregnant and was delivered at term without trouble. A. W. W. Lea (Med. Chronicle, vol. viii, No. 3, p. 177, '98).

Septicæmia.—Septicæmia frequently accompanies excessive hæmorrhage. It may be revealed by fœtidity of the lochia. The latter symptom is not invariably present, however, as no odor may be noticed, notwithstanding active septicæmia. Chill and high temperature may be considered as the positive signs of infection.

Case in which abortion was followed by septic endometritis, salpingitis, general peritonitis, and an abscess of each ovary. Dorsett (Weekly Med. Review, Feb. 14, '91).

Tetanus, etc.—Tetanus and other nervous disorders may follow abortion.

Case of tetanus following abortion at the fourth month. Brownlee (New England Med. Monthly, Nov., '91).

Case of hemiplegia following abortion. The cervix had been dilated with tam-

pons to remove an adherent portion of the placenta. Fenwick (American Jour. of Obst., Apr., '91).

Literature of '96-'97-'98.

Case in which, twelve days after a supposed artificially produced abortion, a 30-year old woman suffered from trismus and tetanus, the convulsions being severe and frequent. Successful treatment by means of antitoxin. Ch. F. Withington (Boston Med. and Surg. Jour., vol. cxxxiv, No. 3, '96).

Etiology.—The causes of abortion may be due to disorders affecting the father, the mother, or the fœtus itself.

Analysis of a large number of cases of abortion occurring in the author's practice give the following conclusions: Habitual abortion gives 18.6 per cent. of the whole. Uterine diseases cause 50 per cent. of the abortions. Reflex causes, either simple or complicated, exist in 21.5 per cent. Syphilis affecting the fœtus, retroflexion, salpingitis, and rheumatism, each 7.1 per cent. There were 78.5 per cent. that subsequently bore children, and 21.5 remained sterile. Of these, 14.3 per cent. have incurable uterine affections or are past child-bearing, and 7.2 are healthy, but sterile. Leith Napier (Satellite of the Annual, Feb., '89).

Paternal Causes.—Abortion may be due to the following paternal influences: Advanced age; lowered vitality, due to overwork or excesses, especially venereal; to syphilis and tuberculosis; and to noxious influences, such as lead poisoning and alcoholism.

Three cases of frequent abortions, due to lead poisoning from service-pipes, which ceased when the cause was removed. Swan (Brit. Med. Jour., Feb. 16, '89).

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Case of a 37-year-old XVIII-para, who has aborted in the last sixteen pregnancies at between the fourth and the seventh months, after her husband became a house-painter, and soon after developed lead colic, followed by paralytic symptoms. She seemed free from any of the symptoms from which her husband suffered, and had not been subject to either tubercle, syphilis, or alcoholism. Before her husband had become a painter she had given birth to two healthy children. Daniel (Journal d'Accouchement, May 17, '96).

Maternal Causes.—Similar causes to those mentioned for the father act in the mother, and with more certainty if both parents are affected by them.

In addition the following noxious influences are to be noted: Tobacco (women employed in tobacco manufactories), carbon disulphide (women employed in India-rubber works), and carbonic oxide. To this latter agent is due the frequency of abortion in cooks, whose profession causes them to breath this deleterious gas during a portion of the day.

Bad hygienic surroundings, especially insufficient food, frequently promote abortion, while overfeeding and obesity (Stoltz) may also act as etiological factors.

Among local causes fibromyomata of the uterus and deviations (especially retroversion) are the most frequent causes.

Analysis of 235 cases with reference to the causes. Syphilis is the most imporant cause, and accounts for 27 per cent. of the cases; retroflexion of the uterus is accountable for 18 per cent.; chronic metritis and endometritis, 10 to 15 per cent.; uterine fibroids, 4.7 per cent.; abnormal conditions of the placenta, 4 per cent.; anteflexion of the uterus, 3.5 to 6 per cent.; molar pregnancy, 1 per cent.; Bright's disease and lateral deviations of the uterus, 0.5 per cent. Römheld (Cent. f. Gyn., No. 39, '95).

Case in which repeated abortions were due to an acute flexion of the uterus. Before the patient's last pregnancy a pessary was inserted, and the cervical

canal frequently dilated, and, after pregnancy had occurred, the elevation of the fundus was favored by the dorsal position, by the use of a pessary, and by occasionally pushing it up with the hand. The woman went to full term, and gave birth to a healthy male child. Graily Hewitt (London Lancet, Jan. 5, '89).

The predisposition to miscarriage in certain women is due to retroversion. Excellent results obtained from the use of pessaries when a miscarriage seemed imminent. Henry Coe (Int. Jour. of Surg., May, '92).

Two causes of successive abortions merit, in particular, the attention of the obstetrician: (1) uterine affections, and retroversion in particular; (2) syphilis. Schuhl (Nouv. Arch. d'Obst. et de Gyn., Feb., '92)

Congestion of the uterus is a more important factor than retroflexion. Leith Napier (Brit. Med. Jour., Dec. 20, '90).

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Distinct local uterine conditions in otherwise healthy women: 1. Ill-developed uterus; the muscular coat does not readily soften, yet remains very irritable. Rare. 2. Displacements, especially flexions. Spur at the angle of flexion hypertrophies interferes with uterine development. 3. Congestion of the body and cervix, due to idiosyncrasies. Endometritis. Charpentier (Ann. de Gyn. et d'Obstét., May, '97).

Extensive laceration of the cervix, the fœtus in such a case not being sustained from below. (Olshausen, Schwartz.)

Old peritoneal lesions of the adnexa, especially ovarian cysts, come next in order as local etiological factors.

Genital Excesses.—These act especially by mechanical means. Young married women frequently abort five or six weeks after conception, on this account, while abortion is frequent among prostitutes for the same reason. (Parent Duchatelet.)

Acute or chronic general diseases, acting either by excess of temperature and changes in the composition of the blood or by alterations in the placenta.

Typhoid Fever.—Abortion occurs in about two-thirds of the cases of typhoid fever, and is more apt to take place during the earlier than the later months of pregnancy.

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Enteric fever materially influences the course of gestation, since abortion occurs in something like two-thirds of the cases. Thus, Sacquin collected 310 cases, and found abortion in 199; while Martinet found 66 abortions in 109 cases. W. Fordyce (Brit. Med. Jour., Feb. 19, '98).

The most prominent feature is uterine hæmorrhage, which is often the first symptom of impending abortion. The use of ergot is to be avoided in cases of pregnancy occurring in conjunction with typhoid fever. Other remedies, such as cold baths or even quinine, may be safely used. The history and treatment of the typhoid state proper remain unaffected by the co-existing pregnancy.

Pneumonia.—During the first months of pregnancy abortion occurs in more than one-third of the cases of pneumonia, but this complication occurs with increasing frequency the more advanced the pregnancy. Taking a general average of cases of abortion occurring during pneumonia, an estimate placing it at two-thirds of the cases is probably correct. The fœtus itself may suffer from pneumonic infection, and die soon after birth from pulmonary, meningeal, endocardial, or other lesions.

Statistics of 213 cases of pneumonia during pregnancy: In 118 cases the pregnancy was interrupted, there being 42 abortions and 76 premature deliveries. Death of the mother occurred in 75 cases among the 213,—a mortality of 35 per cent. The mortality of the mother is

greater in premature deliveries than in abortion. S. Flatté (Thèse de Paris, '92).

Influenza.—It is probable that the marked nervous phenomena play a leading part in the production of abortion. The vasomotors bear the brunt of the toxic effects in the majority of cases, and the secondary results of vasomotor disturbance in the uterus, which is richly supplied with vessels, are obvious.

Report of a number of abortions or premature deliveries resulting from influenza. Trossat (Lyon Méd., Mar. 11, '90).

Doubt whether abortion and premature labor in influenza depend upon mechanical irritation from coughing and hyperæmia, with local congestion. It is very probable that in such cases the cause is infection from the uterine mucosa. Case of abortion occurring during influenza in a girl 19 years old; phlegmasia alba dolens developed three days after confinement, followed on the fifteenth day by pyæmic abscesses in the sternal region. Labadie-Lagrave (La Méd. Mod., Feb. 25, '92).

Measles.—This disease seldom occurs during pregnancy. According to some authorities measles and pregnancy have but little reciprocal influence. Of eleven cases collected by Klotz, however, nine were attended by premature delivery.

The influence of measles is but slight during the first months of pregnancy, and increases in gravity with the age of the pregnancy, the occurrence of this disease in childbed being generally fatal. Besides the danger of puerperal hæmorrhage, pneumonia is a frequent and formidable complication.

Scarlet Fever.—This disease rarely complicates pregnancy, although it is comparatively frequent in the puerperal state. The period of invasion being frequently absent, it is probable, however, that it remains unrecognized, and that a larger proportion of cases of premature birth and abortion are caused by it than is generally supposed. In some cases the stage of incubation is prolonged to such a degree that the scarlet fever contracted during pregnancy is recognized only after delivery by the sudden development of the eruption over the entire body. Of 8 pregnant women suffering from scarlet fever, 6 who were from 4 to 6 months with child recovered without accident, 1 aborted at 3 months, and 1 had a premature delivery at 7 months (Legendre). The cases are generally characterized by high fever, emesis, marked congestion of the face, and sudden appearance of the eruption, which occasionally assumes a livid color.

Small-pox.—This disease manifests a preference for women in whom the pregnancy is not far advanced, but proves much more dangerous when it occurs near the parturient state. It attacks pregnant women oftener than any other disease. The probability of abortion varies with the intensity of the process present. Varioloid causes abortion in about one-tenth of the cases attacked (Mayer). Discreet variola causes abortion in about one-half the cases, while in confluent variola and hæmorrhagic variola abortion nearly always occurs, especially if the pregnancy be advanced.

The fœtus may be expelled during either one of the stages: invasion, eruption, or suppuration. It may present characteristic variolous cicatrices. Occasionally the child remains unaffected; it may also suffer from the disease before or soon after birth, the mother remaining immune.

Among 72 cases of small-pox in pregnant women, 31 miscarriages and 26 deaths. Sangregorio (Med. Standard, May, '88).

Abortion occurring during variola is usually attended with more than the ordinary amount of hæmorrhage. Gasparini (Gaz. Med. Lombarda, No. 18, '92; l'Union Méd., July 5, '92).

Several serious cases occurring during convalescence after small-pox. The grave symptoms are due to the retention of the fœtus, which has died during the acute stage of small-pox, and which is frequently only expelled during or after convalescence. Arnaud (Gaz. des Hôp., July 28, '92).

Cholera.—Women are the most susceptible to this disease during the later period of pregnancy. Abortion almost always occurs, even in comparatively slight attacks, and the prognosis for mother and child is most unfavorable. The abortion has been ascribed to uterine contractions, to acute hæmorrhagic endometritis, and to disturbance of the fœtal circulation caused by the thickening of the blood. It is probable that these three factors are present simultaneously, in addition to placental granular degeneration, which cause the death of the fœtus.

Icterus.—This disorder rarely presents itself during pregnancy. It may occur in three forms:—

(*a*) Simple catarrhal icterus, in which abortion frequently, though not always, occurs; (*b*) icterus gravis, in which abortion always occurs, and is almost invariably fatal; and (*c*) the epidemic icterus, peculiar to pregnant women, which causes abortion in the great majority of cases.

Icterus presents a peculiar feature that renders it important in connection with pregnancy,—*i.e.*, its tendency to either precede or accompany the fatal pathological changes attending yellow atrophy of the liver. Pregnancy exerts a pernicious influence upon the course of even simple icterus, owing probably to the obstruction afforded not only to hepatic circulatory functions, but also those of the kidneys. This would tend to cause reabsorption of the biliary acids and to produce yellow atrophy. Fatal icterus during pregnancy is also due occasionally to the lesions attending phosphorus poisoning.

Malaria does not frequently complicate pregnancy, but causes abortion in about one-half of the cases attacked. Pregnancy seems occasionally to cause a relapse in women apparently cured of malarial fevers. On the other hand, parturition suspends periodical paroxysms, in a large proportion of the cases, for two or three weeks. The malarial paroxysms occurring during pregnancy are characterized by irregularity, and the fœtal movements may be suspended while the paroxysm lasts. Quinia may safely be given even in large doses, which best control the febrile phenomena. The case is different in habitual abortion (*q. v.*).

Although in some cases quinine appears to have little oxytocic action on pregnant women, in others it has the power of exciting uterine contractions, especially in delicate, nervous, and anæmic women. Coromilas (Rif. Med., Nov. 24, '94).

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Case of pregnant woman with malaria to whom 40 grains of quinine were given. Abortion followed after three days which was attributed to the malaria. Plasmodia were not found in the blood of fœtus. G. Dock (Phila. Med. Jour., Apr. 16, '98).

Case of a woman, about 21 years of age, who, being in the third month of pregnancy, aborted after taking the fourth dose of a mixture containing 2 grains of quinine to the dose prescribed for malarial remittent fever. Balagapal (Indian Med. Record, Oct. 1, '98).

Chorea rarely occurs as a complication, and especially affects primiparæ.

It causes abortion in about one-half of the serious cases, and the exhaustion consequent upon the violent muscular movements occasionally proves fatal to the mother. The child, when parturition is approaching, may not be lost with the mother, but it is frequently affected with chorea. In a small proportion of cases of chorea paroxysms cease at the beginning of parturition.

Syphilis.—Whether contracted at the beginning or during the course of pregnancy, syphilis gives rise to very marked and widely spread initial symptoms, while the subsequent symptoms are mild.

When syphilis is contracted previous to conception, abortions occur repeatedly; but, as with time the date of the infection becomes more remote, the abortions occur at a later date in the course of the pregnancy, until premature delivery may occur, and finally delivery at term.

When conception and infection occur simultaneously, abortion is almost constant if no treatment be given; if immediate treatment be instituted the chances of abortion are somewhat reduced.

When infection occurs after conception has taken place, the nearer the two dates of conception and infection are to each other, the more will abortion be likely to occur. A thorough mercurial treatment should be inaugurated as soon as the presence of syphilis is known.

Diabetes.—This disease may complicate pregnancy either on account of its presence before conception, or it may occur during pregnancy only. Abortion occurs in about one-third of the cases, one-fourth of these ending fatally, generally by collapse. The child, though viable, usually perishes. This complication presents itself almost invariably in multiparæ.

Disease of the Heart.—The influence of cardiac disease upon pregnancy varies with the character and seat of the affection that may be present. Generally speaking, however, abortion and premature delivery are frequently observed,—*i.e.*, in about two cases out of every five of heart trouble.

While acute pericarditis seems to bear practically no influence upon the normal course of the gestation, chronic pericarditis is a pernicious accompaniment of pregnancy, owing to the insufficient compensation afforded by the heart itself for pre-existing valvular lesions to satisfy the increased demand upon that organ. Acute endocarditis assumes increased dangers during pregnancy through a marked tendency to assume an ulcerative process, which generally ends fatally.

Mitral lesions, especially mitral stenosis and insufficiency, are considered by Germain Sée and Porak as the cardiac disorders most likely to cause death of the patient. If slight, however, or entirely compensated for, the parturition may occur without trouble. Intense passive pulmonary congestion, œdema, ascites, and metrorrhagia are to be feared in all such cases. Aortic insufficiency or stenosis is generally most marked in advanced pregnancy on account of increased arterial tension, but these untoward symptoms frequently disappear after parturition.

Pulmonary Diseases.—In the great majority of instances pregnancy hastens the development of phthisis, and precipitates its progress. In women predisposed to phthisis the probabilities as to the occurrence of this disease are thus increased by marriage. Although they sometimes escape it during the first

pregnancy, the likelihood that the disease will show itself in future pregnancies is nevertheless great. Abortion or premature delivery is frequent in these cases, and the viability of the child is proportionate to the condition of the mother. Every effort should be made to thoroughly nourish such cases, overfeeding, milk, etc., forming the basis of the measures to be instituted.

Chronic pleurisy, empyema, and emphysema are liable to produce dilatation of the heart and thus render it incapable of compensating for the increased arterial tension of the parturient state. These conditions, however, are more dangerous to the mother than to the child; indeed, abortion under such circumstances sometimes saves the patient's life.

Traumatism.—Brutal treatment of pregnant women, falls, etc., are well-known causes. The farther removed from the genital organs is any traumatism the less likelihood is there of abortion being produced. Even small operations—the opening of an abscess, the extraction of teeth, etc.—have caused abortion.

> Case of shock of body causing rupture of the liver and abortion, followed by death. Mackenzie (Lancet, Sept. 12, '91).
>
> Case of abortion caused by the extraction of a tooth thirteen days before. Labor was immediately preceded by severe hæmorrhage from the dental alveolus. Poyntz (Indian Med. Record, Feb., '91).
>
> Several cases of abortion caused during cotton-picking season, due to the pressure of the loaded apron, which was tied around the waist and left to hang over the distended abdomen. The constant inhalation of the odor of cotton-seed and of the cotton-plant, especially after it has been nipped by the frost, may also cause abortion. Poole (Phila. Med. Times, July 2, '88).

Abortion may be due to too frequent pregnancies. Among other well-known causes may be cited long journeys or short journeys too frequently repeated; excessive walking, climbing, riding, or other physical exercise; falls, moral shocks, etc.

> Case of abortion during the fifth week, the result of mental excitement caused by a quarrel. Purslow (London Lancet, Jan. 25, '90).

Causes Due to the Fœtus or Membranes.—Degeneration of the villosities of the chorion, hydramnion, and vicious insertion of the placenta are the main causes of abortion due to abnormalities of the fœtus and the secundines.

Prognosis.—The embryo, or fœtus, always perishes; the prognosis, therefore, only applies to the mother. Cases of spontaneous uncomplicated abortion almost always recover with proper care. The cause of the abortion, the date of the pregnancy, the degree of antisepsis employed, or the previous cleanliness observed by the patient all bear influence upon the final issue of the case.

In Pinard's service the mortality of abortions was 0.81 per cent., of abortions having begun outside the service, 27.5 per cent. At Bellevue Hospital no case of death has occurred since it has become customary in that institution to empty the uterus in every case of incomplete abortion. Out of 926 cases noted by Hirst there were 13 deaths,—a mortality of 1.4 per cent.

As to the mortality of the product of conception, out of 434 cases in Pinard's service, the fœtus was born alive in 221, dead and macerated in 199, and died during delivery in 14 cases.

In abortion due to syphilis the fœtus is almost always dead and macerated; in abortion due to vicious insertion of the

placenta, almost always alive; in albuminuria in about equal proportions.

Involution of the uterus is usually more rapid than after normal delivery, on account of the lesser size of the uterus. Incomplete delivery may be a cause of imperfect involution. Patients should be kept in bed ten days. Metritis is likely to be the sequel of abortion when the patient is allowed to leave her bed too soon. The influence of perfect involution on future pregnancies is marked.

> Analysis of 100 cases showing that pregnancy occurs subsequent to abortion in 38 per cent. of the cases where there was total or partial retention of the decidua vera, against 6.29 per cent. where this membrane was removed. Winter (Deutsche med.-Zeit., Oct. 13, '90).

A woman may lose immense quantities of blood in a threatened abortion, appear moribund from exsanguination, and yet rally and go on to full term under appropriate measures.

Diagnosis.—Pain, hæmorrhage, dilatation of the cervix, and descent of the ovum are the characteristic features of abortion which easily distinguish it from other disorders.

Dysmenorrhœa may be mistaken for impending miscarriage. In this disorder the cervix is closed and firm and the pain precedes hæmorrhage. In abortion, on the contrary, the cervix is open and soft and the hæmorrhage usually precedes the pains.

Organic lesions of the cervix—such as tumors, etc.—sometimes give rise to hæmorrhages; but the history of the case and a careful local examination will generally establish the nature of the condition present. A soft polypus may, however, resemble a small ovum, and increase the difficulty.

Hepatic colic and nephritic colic sometimes simulate labor-pains, but the absence of hæmorrhage from the vagina, and the intensity of the suffering, soon establish the identity of these diseases.

Threatened abortion being the condition present, the next point is to ascertain whether the abortion is inevitable.

Abortion is inevitable (1) when the membranes are ruptured, (2) when the fœtus is dead, or (3) when any fœtal part is already engaged in the cervix (Auvard). So long as symptoms of these three conditions are not present, abortion *may* not occur.

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> A correct diagnosis as to whether the case is one of "threatened," "complete," or "incomplete" abortion is determined by (1) the nature of the mass expelled from the uterus. (2) The continuance or cessation of the hæmorrhage, the former being absolutely indicative of imperfect expulsion; the latter, however, cannot be considered proof of complete expulsion. (3) The shape of the cervix. "This is altered according to the state of the dilation of the internal and external os. In 'threatened' abortion, the internal os is usually dilated more than the external, shown by the widening of the cervix at its base. When the ovum has been expelled completely, the external os is more dilated than the internal." Jellett (Dublin Jour. of the Med. Sci., May, '97).

When symptoms, such as hæmorrhage, have occurred, it is often difficult to determine whether abortion has really taken place, and, if so, whether it is incomplete or complete. Uterine exploration may then become necessary.

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> Uterine exploration when hæmorrhage is present during pregnancy is indicated (1) when the patient has lost so much blood that we fear the results of further loss, (2) when a known portion has been expelled and the remainder is re-

tained *in utero*, and (3) when the ovum is manifestly dead, yet unexpelled. Jellett (Dublin Jour. Med. Sci., May, '97).

During the first weeks of pregnancy the embryo may be so small as not to be easily found, and a positive diagnosis may not be established until, by subsequent events, continuation of pregnancy or involution of the uterus take place. When the fœtus is dead it may remain in the uterus and the latter be thought, by the attending physician, to be empty. In some cases, even after hæmorrhages and the expulsion of portions of the secundines have taken place, the interruption of pregnancy has only been apparent.

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Irregularities relating to abortion: One was a twin delivered at the fourth month and its fellow expelled two months earlier. A three-months' fœtus delivered at the seventh month. No flooding was observed about the time of its death or later in the pregnancy. Platzer (Centralb. f. Gyn., No. 38, '97).

Tubal abortion may simulate common abortion. The ovum is not invariably expelled from the ostium of the tube and discharged into the uterus. Case in which a complete decidua was discharged, the ovum being subsequently expelled. The diagnosis was supported by the detection of a thickening of the right cornu. Skutsch (Centralb. f. Gyn., No. 25, '97).

Spurious abortion. A class of cases in which a mimicry of early pregnancy and of abortion occurs quite different in its characters from the condition known as "spurious pregnancy." They are not associated with hysteria, and the usual functional disturbances of pregnancy are not exaggerated. They differ from pseudocyesis in the existence of definite changes in the uterus, and from pregnancy, either topic or ectopic, in the essential point of the absence of an ovum. A mimic abortion: in the occurrence of a period of amenorrhœa with enlargement of the uterus and formation within it of a body, the detachment and expulsion of which is followed by a return to menstrual regularity and the former condition of general health. The body expelled is not an ovum, but is formed entirely from menstrual structures. Three cases recorded.

A membrane having the essential characters of the decidua of pregnancy. Diagnosis impossible until after the discharge of the cast. T. W. Eden (London Lancet, Sept. 25, '97).

Treatment.

Threatened Abortion. — Absolute mental and physical rest is imperatively demanded. The patient should be kept in bed, with her hips slightly elevated, and be given only light and cool food.

To arrest the uterine contractions tincture of opium, 12 drops every two hours, may be given by the mouth; or extract of opium, 1 grain in a suppository, every three hours. If the pain is severe, morphia, $\frac{1}{4}$ grain, and atropia, $\frac{1}{60}$ grain, should be administered hypodermically. Laudanum enemata, 25 drops to $\frac{1}{2}$ pint of water, are also effective. If an idiosyncrasy preclude the use of opium, chloral hydrate, 10 grains, and bromide of potassium, 20 grains, every two hours, then every three hours, may be used instead.

A good method is to administer opium, one-half of the dose under the form of laudanum enemata and the other half as subcutaneous injections of morphine (Ribemont). Constipation from the effect of the opium is to be avoided.

Large doses of opium, hot applications to the abdomen, and rest. Von Brehm (St. Petersburger Med. Woch., p. 77, '90).

Bromides are useful in addition to opium. Werder (Pittsburgh Med. Review, May, '91).

Subcutaneous injection of ¼ grain of morphia, with $\frac{1}{60}$ grain of atropia.

Bedford Brown (Indiana Med. Jour., Aug., '91).

The fluid extract of viburnum prunifolium, ½ to 1 drachm every three hours or 10 drops every half-hour, with chloral hydrate, 8 grains, is valuable to arrest uterine contractions when opium cannot be used on account of its constipating tendency.

Viburnum prunifolium is useful, in very small doses, in threatened abortion. If too large doses are given, the uterine contractions appear to be increased. H. C. Wood (Med. Standard, June, '89).

The solid extract of viburnum prunifolium, administered in doses of 45 to 60 grains for months, is a very valuable remedy for reducing, and even suppressing, the uterine contractions which are so apt to occur in women who have aborted in previous pregnancies. Schatz (Int. klin. Rund., No. 26, '88).

The tincture of viburnum prunifolium is useful in cases where the membranes have been ruptured and the liquor amnii discharged, but where there are still hopes of preventing a miscarriage. It should not be given, however, when the fœtus is dead, when a miscarriage has actually commenced, or when there is any reason why it is not best that birth should be delayed. Auvard (Boston Med. and Surg. Jour., Mar. 22, '88).

Viburnum paralyzes both the centres of voluntary motion and the reflex functions of the spinal cord without impairing sensation or consciousness, and it is consequently destined to become an approved remedy in all diseases characterized by increased excitability of the motor centres. The solid extract of the drug is recommended, in doses of from 5 to 10 grains, and the fluid extract in doses of from ½ drachm to ½ ounce. R. L. Payne (Med. News, Apr. 2, '92).

Inevitable Abortion.—When abortion cannot be avoided, all the foregoing measures are contra-indicated.

During the first two months but little treatment is necessary other than rest in bed. If no untoward symptoms appear, such as marked hæmorrhage, rise of temperature, etc., expectant measures are sufficient, at least for some days.

During the third month the ovum may be expelled entire,—*i.e.*, without rupture of the membranes. In this case no active measure is required beyond, perhaps, an antiseptic douche,—a creolin 2-per-cent. solution or a weak carbolic-acid one,—employed twice daily.

When, in the course of the third month the sac ruptures and the liquor amnii escapes, the sudden reduction of the pressure exerted by the ovum upon the intra-uterine surfaces causes free hæmorrhages from the utero-placental vessels.

Hæmorrhage.—The treatment of the hæmorrhage at this period is that for the subsequent ones. The patient being placed in the Sims position, all clots are removed and the vagina is packed with iodoform gauze or cotton-wool. If the bleeding persist, vaginal douches of hot alum solution, 1 ounce to the pint, are administered. The packing is then renewed, and 3 drachms of the fluid extract of ergot are injected into the rectum. If the bleeding is alarming, the uterine canal may be packed with small pledgets of iodoform cotton or gauze.

Whenever abortion takes place none of the tissues should be left in the uterus. 1. At 4 weeks best to keep down hæmorrhage and to wait for nature to act; if interference necessary, decidua to be removed, using the curette. 2. At 6 to 8 weeks chorion causes most trouble; finger or curette used and strip of iodoform gauze introduced to fundus. 3. At 10 to 12 weeks fœtus comes first; other tissues apt to need artificial removal; finger best; gauze as before; small doses of ergot for twenty-four hours. Edward Ayers (Medical Record, Sept. 28, '95).

When fragments of placenta or other adnexa are left in the uterus they rapidly

give rise to foul discharge, which may be followed by grave septic symptoms. The patient should at once be placed in the Sims position and be given an anæsthetic, if necessary. The endometrium is then thoroughly cleansed and curetted, then washed out with hot 1 to 5000 corrosive-sublimate solution. No ergot should be administered until the uterus is thoroughly emptied. The external genitals are then carefully cleansed and a compress of carbolized cotton is applied over the vulva. Lysol, in 1-per-cent. solution, is highly recommended for injections in infectious cases.

In many cases interference is necessary, because we deal with conditions which favor a retention of secundines, a broken ovum, or a displaced, a septic or otherwise-diseased uterus. A temperature of 101° F. is always a distinct indication for immediate cleansing out of the uterus. Large, hot, antiseptic, intra-uterine injections should follow this, and the uterus be drained by gauze. E. J. Hill (Annals of Gyn. and Ped., May, '95).

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So long as abortion is progressing safely all interference and especially curettage is to be deprecated. But so soon as septic symptoms arise then the uterus must at once be emptied of its contents, and the curette is the best instrument. The operation must be done as thoroughly as possible and with every attention to technique one would give to a laparotomy. R. L. Payne (N. C. Med. Jour., July 5, '98).

Delayed Abortion.—When this occurs prolonged expectant treatment exposes the patient to dangerous hæmorrhage and septicæmia; hence early active measures are indicated. If the adnexa are not expelled in twenty-four hours, injections of hot carbolized water into the uterus, between its walls and the ovum, every three hours, using a Bozeman catheter, may be employed; or, if the hæmorrhage is controlled and the os is sufficiently patent, the finger may be introduced, then hooked, and the uterine contents evacuated.

If the os is not dilated, a piece of iodoform gauze or an iodoform bougie can be inserted; in from twelve to twenty-four hours the finger can generally be introduced and the adnexa removed. If this is difficult, a blunt curette may be employed instead of the finger, preferably Thomas's large model. Sims's sharp curette is also highly recommended. If used with due care it is an excellent instrument.

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The curette is not sufficiently employed in cases of abortion. Used personally in 211 cases at the maternity,—134 times for abortion and 77 times for chronic metritis. The hæmostatic effect was immediate, the flow of blood ceasing as soon as the uterine cavity was relieved of its contents. The hæmorrhage should serve as a guide to the operator, who should continue curetting until all flow has stopped, or, in other words, until the last of the *débris* has been eliminated. Ch. Patru (Univ. Med. Jour., Mar., '96).

"When intervention is necessary, instead of the curette I simply use my finger, which is a marvelous instrument for one possessed of intelligence, while the curette is a blind instrument which I only use when there is hæmorrhage or infection." For intra-uterine injections a solution of permanganate of potassium recommended. Tarnier (L'Union Méd. du Can., Nov., '97).

To use the finger as a curette is, in most cases, unsatisfactory, even when one hand is used for pressing the fundus down. The finger is often arrested at the internal os or does not reach the uppermost part of the cavity, and, at all events, it can only be used to separate the ovum from the uterus, and cannot remove the decidua vera. Henry J. Garrigues (Med. News, Nov. 6, '97).

Condition indispensable and invariable for the efficient and thorough use of the curette after abortion,—namely: that the uterine canal should be sufficiently dilated to permit the index finger to explore the uterine cavity to the fundus, in order not only to determine the quantity and location of the retained secundines, but also to enable the operator to be perfectly sure that the cavity has been entirely emptied when the operation is completed.

An empty uterus after abortion almost always contracts, and all hæmorrhage from its cavity ceases. A failure to contract at that time is an exception. If a hot sterilized or carbolized intra-uterine douche is used after emptying an aborting uterus prompt contraction and cessation of bleeding takes place. Only in women very much exhausted from hæmorrhage might it be advisable to pack the empty uterus after abortion with iodoform gauze, or, better, sterilized gauze, in order to save her even the few drops of blood which would ooze away during the first day or two, until she has rallied. Paul F. Mundé (Med. News, Nov. 27, '97).

In abortion curettage much to be preferred to digital exploration and evacuation of uterine cavity, as the curette can always be much more safely sterilized than finger of physician. Hermann Biermer (Centralb. f. Gynäk., May 28, '98).

Case in which patient had been curetted on two occasions to remove remains of incomplete abortion. At second operation, failing to remove all placental tissue with curette, uterine cavity was plugged, and, after forty-eight hours, finger introduced and remaining portions removed. Severe hæmorrhage led to extirpation of uterus. On microscopical examination, material removed by curette proved presence of muscular tissue. Conclusion that placenta in this case must have been abnormally adherent, and uterine wall abnormally soft, and that the finger is a better instrument than curette in imperfect abortion. Dührssen (Berl. Med. Soc., May, '98).

This treatment, if applied sufficiently early, causes a reduction of temperature. Within an hour or two a chill may indicate slight absorption of infectious elements through the vessels laid open during the operation; but rapid improvement usually follows.

When the curette is used the softened condition of the uterine tissue should be borne in mind; death from perforation has been reported. (Alberti, Long, (Haynes.)

Literature of '96-'97-'98.

Many accidents have been attributed to the curette. Récamier reported three cases from perforation of the uterus by his curette; Dumarquay two; Chamberlain had a case of hysterical tetanus; Peaslee, a death from collapse; Thomas, a narrow escape from the same cause; and Parker, a case of peritonitis. But in these cases it was not the Sims sharp curette. It should, of course, be handled with ordinary common sense in order not to cut too deeply and, perhaps, perforate the uterine wall. Personally used in a large number of cases without accident. Goldberg (Buffalo Med. Jour., Aug., '97).

In 99 cases (out of 275) requiring operative interference, 55 were treated by digital exploration and removal of fragments, and 44 cases were treated by curetting. In this series of cases 6 deaths occurred. In 2 cases, at the autopsy, a perforation was found at the fundus uteri, with peritonitis. Both cases were already infected before reaching the hospital. In 1 curettage had been carefully performed; in the other the uterus had merely been packed with gauze. The third fatal result was due to suppurative salpingitis, operated upon after leaving the hospital. The 3 remaining deaths were due to infection, the patients arriving at the hospital with grave septic symptoms. Maygrier (L'Obstétrique, July, '97).

Antiseptic douches are important to remove what *detritus* may remain behind a 3-per-cent. carbolic-acid solution from the endometrium after curetting.

Packing of the uterine cavity with iodoform gauze after curetting is not a safe procedure; it has caused peritonitis.

The too copious use of corrosive-sublimate solution for injection has caused death. If the cervix will not yield to simple measures, Hegar's, Ellinger's, or Barnes's dilator may be used.

Literature of '96-'97-'98.

New method of treating incomplete abortion: With Bozeman's intra-uterine douche, a hot-creolin solution is allowed to flow, always watching to see that the return-current remains free. All loose clots and *débris* are removed by the dull curette. The cavity is again washed, until nothing remains but the firm decidual tissue (which clings to the uterine wall) and the creolin solution returns white. Finally the uterus is packed from the fundus to the external os with iodoform gauze. The first gauze is withdrawn, thereby wiping out the cavity, and a second piece is firmly placed so as to stop all hæmorrhage. No opiate is allowed.

As a result of this procedure the inert uterus is stimulated to contract. The blood, unable to escape, distends the cavity and flows in between the decidua and the uterine wall, dislodging the former. Finally, the internal os dilates, the gauze is expelled, and all the uterine cavity with it. Another creolin intra-uterine douche is then given, and, if endometritis exist, the gentle use of the sharp curette and a gauze drain complete the work. Contraction and involution of the uterus go on rapidly. Three illustrative cases. Anna M. Stuart (N. Y. Med. Jour., Sept. 6, '96).

In curetting after incomplete abortion three following points insisted on: 1. Before introducing the curette a sound should be used and the length it penetrates marked on curette. 2. A speculum should always be used. 3. Iodoform (or, preferably, xeroform) gauze should be introduced into the uterine cavity after curetting in hæmorrhage, or the gauze should be packed well in to excite uterine contraction and left there for twenty-four hours; in infection it is introduced loosely to act as a drain into vagina, into which a plug of cotton-wool is placed to absorb discharge. Beuttner (Rev. Méd. de la Suisse Rom., Jan. 20, '98).

The following procedure recommended in incomplete abortion: Under chloroform cervical canal is dilated with, first, index finger and then middle finger. Uterus is fixed with hand acting through abdominal wall. Then, with two fingers or one, interior of uterus is thoroughly scraped. To evacuate uterus it is sometimes sufficient to make traction on placental fragments with fingers or with one finger hooked. Usually it is necessary to employ uterine expression, done by placing two fingers in posterior vaginal fornix and pressing them forward, while with other hand placed on hypogastrium pressure is made on anterior fundus uteri. Uterine cavity is then washed out, and mixture of glycerin and creasote applied. Only when there is any hæmorrhage and the uterus does not retract properly it is necessary to plug utero-vaginal canal with iodoform gauze. P. Budin (Progrès Méd., Sept. 17, '98).

Expectant treatment, antisepsis being the only measure resorted to, is preferred by some (Varnier and Pinard), active procedures being only resorted to in cases of serious hæmorrhage or infection.

Study of 4333 cases in Tauffer's clinic tending to demonstrate that even retained membranes should only be removed when decided indications are present. Velits (Int. klin. Rund., Mar. 8, '91).

In cases of retention of the placenta after abortion the practice of Tarnier is as follows: 1. Antiseptic preliminary injections either of permanganate of potash, 1 to 2000, or of carbolic-acid water, 20 to 1000, with iodoform or salol dressings to the vulva. 2. In case there is danger of infection through putrefaction of the placenta, recourse should be had to digital and antiseptic curettage

after dilatation. 3. When the physician is called after septicæmia has become generalized, or when the symptoms of infection are very pronounced, it becomes necessary, considering the imminence of the danger, to resort to curettage of the uterine cavity, using, at the same time, all antiseptic precautions. Quinine, in large doses, has recently been recommended.

Literature of '96-'97-'98.

Expectant treatment of abortion is recommended from observations gathered from Winckel's clinic, in Munich. M. Stumpf (Jahrb., vol. ccxxxix, p. 248, '96).

The expectant treatment of abortion is to be preferred. Packing of the uterus and vagina recommended. Of 292 cases observed only one ended fatally. This patient was already infected and suffering from high fever. Curetting and local treatment were unsuccessful.

It is best to leave, as long as possible, the expulsion of the ovum to the natural forces, which in many cases of abortion are better able to do it than our hands and instruments. When some special danger exists for the mother, however, or when the termination of the abortion may easily be accomplished, interference is permissible.

The fear of packing, which until recently was prevalent, has disappeared, for, with due precaution, it is without danger. There is not so much danger of infection with it as with manual and instrumental procedures. P. Müller (Volkmann's Samml. Klin., Vort., No. 153, Apr., '96).

Electricity may be used as a substitute for the curette in incomplete abortion. For the immediate removal of retained secundines the faradic current is employed, but, for the removal of these after retention for some time, the galvanic is preferable.

Case in which the galvanic current was used very successfully, the strength being 60 milliampères, and the application continued for eight minutes and repeated three times. The positive pole was introduced into the uterus, the selection being made because of the local effect, since this pole promotes coagulation, and is hæmostatic; a fourth reason is added as probable, but not proved,—its antiseptic powers. H. D. Fry (Amer. Jour. of Obst., vol. xxi, p. 593).

Injections of cold water successfully used in retention of the placenta, in a woman who had expelled a fœtus of six months. Immediately after the lavage the uterus contracted and the placenta was also expelled. John Morton (Indian Med. Record, Dec., '91).

Literature of '96-'97-'98.

Quinine administered in 30-grain doses has given good results by causing the expulsion of retained placental fragments in about sixty personal cases. The first occurred in 1873, and the retention had lasted one hundred and nine days. Cordès and Ch. Patru (Rev. Med. de la Suisse Rom., vol. xvi, p. 5, '96).

Seven cases of retained placenta after abortion, in which 7½ grains of quinine were given twice at ten minutes' interval. As a rule, the placenta was expelled in four hours and a half by the stimulation of the uterine muscular fibres caused by the drug. In several instances the pains had ceased for hours. Hence the action of the quinine was positive. No bad results observed and no tetanic contractions. Schwab (Annales de Gyn. et d'Obstét., May, '97).

Streptococcic serum in the septicæmia of abortion has been used with success.

Literature of '96-'97-'98.

Case of septicæmia superinduced by abortion treated primarily by curettement without appreciable improvement, but which rapidly convalesced after one injection of 10 cubic centimetres of antistreptococcic serum. Munro Campbell (Brit. Med. Jour., Jan. 29, '98).

Exhaustion from Hæmorrhage.—This condition may be treated by rectal injections of 1 or 2 quarts of cool saline

solution, or careful injection of hot (120° F.) saline solution into the femoral artery (middle of Poupart's ligament), using a large hypodermic needle connected with a Davidson syringe. Subcutaneous and rectal saline injections may be given simultaneously, if need be. Hypodermic injections of $^1/_{60}$ grain of strychnia enhance the action of injections.

Case of acute anæmia, the result of an abortion, treated successfully by the intravascular transfusion of 1½ litres of saline solution (6 per cent. common salt). Morel (Revue Méd. de la Suisse Rom., p. 40, '88).

Two similar cases in women 38 and 39 years of age, respectively, treated with equal success by the subcutaneous injection of 1¾ pints of the same solution. Pregaldino (Bull. de l'Acad. Royal de Méd. de Belg., Oct. 27, '88).

In a case of profuse hæmorrhage after abortion *rectal injections of saline solution* were used, with gratifying results. The entire quart or two quarts injected were absorbed in four or five minutes. The first indication of the rise of temperature toward the normal is a chill. Then follow fuller and stronger pulse and general improvement. Cool water is more active and more quickly absorbed than warm. Warman (Ther. Monat., Sept., '93).

Literature of '96-'97-'98.

Case illustrating the hæmostatic influence of the intravenous injection of artificially-prepared serum in profuse hæmorrhage after abortion. Le Clerc (Revue int. de Méd. et de Chir., No. 11, '96).

Habitual Abortion. — *Etiology.* — Habitual abortion may be due to either constitutional or local causes. Of the former the principal are syphilis, lead poisoning, tobacco poisoning, and heart disease.

The local causes are divided into four groups: Malformations of the uterus, displacements of the uterus, active congestion of the uterus and especially of the cervix, and diseases of the cervix or body of the uterus.

Malformations.—In these cases the uterus has preserved some of the characters of the infantile uterus, the body being disproportionately small or the cervix disproportionately large. Distension of the uterus by the growing ovum causes severe attacks of uterine colic and sympathetic disturbances, which commence during the second month, and usually lead to abortion about the third or fourth month. These cases are not common, because fecundation is rare in the malformed uterus.

Displacements.—Flexions are of more importance in this connection than either versions or prolapse. In ante- or retro- flexions there is a thickening of the uterine tissue at the angle of flexion, which interferes seriously with the progress of pregnancy, and leads to repeated abortion at the third or fourth month.

Congestions.—In the case of women who habitually lose freely at the monthly periods it is not uncommon to find that during pregnancy they have a periodic loss of blood, accompanied by pain, especially during the latter months. In plethoric women these hæmorrhages during pregnancy are beneficial, and should not be arrested.

Diseases of the Uterus.—Endometritis, new growths of the body of the uterus, and extensive erosion of the cervix usually lead to abortion. (Charpentier.)

Treatment.—The causes should be sought after and any existing affection removed, if possible. Syphilis especially requires prolonged and curative treatment. In congestions of the uterus, Carpentier recommends wet cupping of the loins to relieve the engorgement, and thus enable the uterus to retain the

ovum. Any special irritability of the genital organs that may exist should be treated by rest in bed for some days at the menstrual period during pregnancy.

Viburnum prunifolium, ½ to 1 drachm of the fluid extract twice daily, or asafœtida, 1 grain in pill three times daily, as soon as pregnancy is suspected, and gradually increased, are frequently recommended. Chlorate of potassium, 15 to 30 grains daily, is valuable in this connection, but is more likely to disturb the stomach.

A large number of drugs possess more or less marked powers as abortifacients and hence should be avoided during pregnancy. Quinine, cantharides, pilocarpine, strychnine, erigeron, elaterium, jalap, podophyllin, aloes, senna, scammony, and violent purgatives in general, especially those likely to cause engorgement of the hæmorrhoidal vessels, are the most pernicious agents in this particular that are in general use as remedies for other conditions.

Although quinine appears to have but little oxytocic action in some, in others it excites uterine contractions, especially in delicate, nervous, and anæmic women; it should not be given in large doses unless with some narcotic that will act as sedative upon the uterus. (Coromilas.)

To replace quinine, when indicated for malaria, phenocoll, which, while efficient for malaria, has no action on the uterus; 22 grains divided in four cachets given five, four, three, and two hours before febrile paroxysm. Titone (Brit. Med. Jour., Mar. 23, '95).

Quinine, by setting up uterine contraction, may cause abortion during the first three months of pregnancy. The action during the middle months is uncertain, but it appears to grow less harmful as pregnancy advances. Merz (Bull. Méd. de l'Algérie, Jan., Feb., '90).

Literature of '96-'97-'98.

Case of abortion from the use of guaiacol. Phenol and its derivatives exert a paralyzing action on the vasomotor centres; so that they may produce abortion by causing defective nutrition of the fœtus. Patient may have had an idiosyncrasy for guaiacol. J. Petrasko (Pester med.-chi. Presse, No. 5, '96).

Cases of so-called habitual abortion, which so commonly depends on a diseased state of the endometrium, may be overcome by a two minutes' steaming at 212° F., followed, for six or eight days, with applications of tincture of iodine.

Results in ten cases: In five the fever disappeared speedily by crisis, in two lysis occurred, and in three there was no notable fever to begin with. The occurrence of lysis indicates infection of a moderate grade. In almost all cases the odor ceased at once or became so slight as to be hardly noticeable. Pincus (N. Y. Med. Jour., Mar. 20, '97).

Mercury recommended for habitual abortion, not only in cases dependent on syphilis, but also in those of unknown origin. The following formula employed:—

℞ Corrosive sublimate,
Extract of opium, of each, 1 ½ grs.
Extract of licorice,
Powdered licorice, enough to make a pill mass.

M. Divide into 30 pills. One to be taken every evening.

Dose may be increased after giving above for one month. Viburnum prunifolium and hydrastis to be given in case moderate hæmorrhage occurs. Bossi (Klin.-therap. Woch., July 31, '98).

In cases in which women who are usually regular pass over a period, as well as in habitual abortion, exhibition of 5 to 8 grains of acetanilid, repeated in one, two, or four hours as necessary, advocated. In cases of ovarian irritation, where there seems to be tendency to separation of ovum at what would have been a menstrual period, more or less regular use of viburnum prunifolium and potassium bromide, with acetanilid at time of each periodic disturbance, recom-

mended. In emergency cases acetanilid 10 to 15 grains, repeated at short intervals, should be given, but in every instance individual susceptibility should be considered. Harnsberger (Jour. Amer. Med. Assoc., Oct. 22, '98).

Missed Abortion. — The embryo sometimes dies as a result of the conditions giving rise to abortion, and remains in the uterine cavity,—the so-called "missed abortion." The active symptoms of miscarriage may be present; or the patient may only ascertain by the cessation of all fœtal motion that it is no longer living. The fœtus may entirely disappear, or become transformed into a shrunken remnant. They are most frequently expelled within six months, but sometimes remain in the uterus as long as eleven months. The usual symptoms of premature delivery are gone through. In its altered condition, the product is variously termed "fleshy mole," "blighted ovum," or "apoplectic ovum." The occurrence of this complication is comparatively rare. It may repeatedly occur in the same woman.

Case in which missed abortion occurred three times. Balin (Cent. f. Gyn., No. 17, '90).

Case of missed abortion in which the embryo perished during the second month of pregnancy, and was retained until the tenth month. I. Kobro (Norsk Mag. f. Läg., 4 R., X 12, S. 1110, '95).

Case in which a fœtus, which died at the fourth month was retained in the uterus for eight months longer, when it was artificially removed. No evidence of decomposition was present. Ross (Annual, '91).

Literature of '96-'97-'98.

Case of missed abortion in a patient who had last menstruation in April, '97, and who came into hospital in February, '98. Soon after admission she expelled four months' ovum. Placenta and ovum were hard and whitish in color. Microscopically characteristic villi were seen, also Langhan's cells and syncytium. In other portions decidua of uterus had begun to regenerate in normal manner. Patient made recovery. Iwanoff (Centralb. f. Gynäk., No. 38, '98).

The first factor is the death of the fœtus; this is followed by shrinking of the chorionic sac and blood-extravasation among the villi. As a result, numerous small, rounded protrusions are to be seen when the interior of the sac is examined,—the so-called "subchorionic hæmatomata," "tuberous subchorionic hæmatomata," or the "tuberculous ova" of Granville. They are considered by some observers as malignant.

Literature of '96-'97-'98.

When the fœtal circulation ceases, the vessels of the placenta are rapidly obliterated. The fœtal epithelium covering the chorion and its villi degenerate, and the maternal blood between the villi forms clots, which are altered into dense laminated fibrin. The decidual cells then multiply and invade the fibrin, which they gradually replace, filling the intervillous space with layers and bands of decidual tissue. At the same time they disintegrate the fœtal epithelium, which comes to be represented by scattered heaps and rows of nuclei, and finally disappears. The amnion remains almost unaltered, but adheres closely to the chorion, and the united membranes are thrown into folds and convolutions, covering the rounded lobes of altered placental tissue. The fœtal portion of the placenta does not grow after the death of the fœtus, though the maternal portion containing the decidual cells remains active. It is therefore improbable that malignant new growths can arise from fœtal placental elements. W. E. Fothergill (Brit. Med. Jour., Mar. 20, '97).

The fleshy mole is undoubtedly a form of the process known as "abortion," but the obstetrician should remember that the pathological changes which produce it may occur at very different stages of

pregnancy. The precise time at which the arrest of normal pregnancy occurs cannot always be determined by examination of a fleshy mole. Neumann (Monats. f. Geburt. u. Gyn., Feb., '97).

The first symptom is usually a bloody discharge, which is frequently taken for the return of menstruation. The uterus is found to be enlarged according, of course, to the size of the fœtus, and the internal os generally permits of the introduction of a finger-tip. The presence of the ovum, or fœtus, may therefore be ascertained in a proportion of cases, but when this is impossible the diagnosis is established with difficulty. The discharges generally become very fœtid, however, and suggest, by the character of the odor emitted, the nature of the body present.

Treatment. — Removal of the dead fœtus is the only course to be pursued. The means are precisely those for the removal of the placenta just described, the strictest antisepsis being observed.

Induced Abortion.—As the induction of premature labor will be treated fully under the heading of Pregnancy, mention is only made here to the removal of the product of conception during the earlier months of pregnancy. It is seldom necessary to induce abortion at this time, as the disorders occasionally rendering this step obligatory are frequently amenable to other measures. The most important conditions that may necessitate this step are incoercible vomiting, heart disease threatening life, and serious hydramnios.

Many drugs—such as saffron, tansy, wormwood, cinnamon, horehound, etc. —generally considered as capable of provoking expulsion of the fœtus, are practically without effect, while more powerful agents—such as rue (*Ruta graveolens*), savin, red cedar, *Arbor vitæ*, and yew—are only active when giving rise simultaneously to dangerous general symptoms. In women predisposed to abortion, however, all these drugs, besides others previously mentioned, are capable of exciting expulsive contractions of the uterus.

The means for the purpose are, briefly, catheterization of the uterus, injections between the uterus and ovum, mechanical dilatation of the cervix, the vaginal tampon or douche, and electricity, all of which means will be given in detail later on, as stated.

It is important to bear in mind, in this connection, that a physician should never perform abortion without one or more consultants.

Case of incoercible vomiting in which abortion was necessary. The patient was in the third month of pregnancy, which, until then, had been normal. Three applications of a laminaria tent into the uterus to induce abortion were without result. Curettage of the uterus under anæthesia, embryo, placenta, and decidua being removed. Sublimate irrigation and uterine tampons of iodoform gauze. The patient revived by subcutaneous injections of ether and caffeine. Recovery was rapid. Blanc (La Loire Méd., Mar. 15, '93).

Cases of incoercible vomiting, in which abortion at the end of the second month was found necessary. Bevill (Medical Record, Aug. 27, '92); Murphy (N. Y. Med. Jour., June 4, '92).

Literature of '96-'97-'98.

The practitioner may terminate pregnancy without breaking the law when the patient's life is necessarily exposed to great danger if the pregnancy is allowed to continue, but after adequate consultation. When the patient is subject of really dangerous variety of vomiting of pregnancy—an extremely rare condition, —it becomes justifiable to terminate the pregnancy. Another morbid condition justifying induction of abortion is renal mischief that has supervened more or less acutely since commencement of preg-

nancy with marked albuminuria, general œdema and perhaps ascites, and presence of casts in urine and other grave symptoms of renal insufficiency. No doubt, in some cases of contracted pelvis, where it is impossible for a living child to be born unless the mother is prepared to run risk of Cæsarean section, she is entitled to exercise a choice. The safest course is not to prematurely terminate a pregnancy until it has been shown to be necessary by inadequate and independent examination of the facts by at least two medical men and after consultation between them. Editorial (Lancet, Jan. 22, '98).

Criminal Abortion.—In all civilized countries most severe punishment is inflicted upon criminal abortionists; in most of them the penalties are increased if the crime is committed by professional persons, such as medical men, midwifes, and druggists. Notwithstanding this, criminal abortion is extremely frequent, principally in large cities.

It is generally between the second and fifth month of pregnancy that abortion is artificially produced.

Criminal abortion is performed by means of drugs and by local and surgical intervention. A large number of drugs were, until recently, thought to possess active ecbolic properties, but a more elaborate study of the question has shown that no drug has a special action upon the uterus for expulsing the product of conception.

The only fact to be admitted in a medico-legal point of view is that some drugs may cause abortion in predisposed women, but more by the general disturbance of the system than by any specific action on the womb. The strong catharties (scammony, jalap, etc.), given in large doses, may be classed in this category. Caustic acids are also active in the same sense.

Eight cases in which criminal abortion was induced by nitric acid, 15 to 20 drops daily, gradually increased. The symptoms showed themselves in from six weeks to three months after the beginning of the ingestion. The abdominal pains were intense. Three women died, two became insane, and one was artificially delivered. The abortive action of the nitric acid was probably due to its effect upon the blood. Bellin (Nouv. Arch. d'Obst. et de Gyn., Oct., '91).

Examination of 72 women on whom criminal abortion had been performed. In 1 case death resulted from nervous shock.

In 5 other cases, during or shortly after the injection, faintness, dizziness, and vomiting occurred, lasting several hours and disappearing without leaving any trace. In nine-tenths of the cases there was no special disturbance. Abortion usually resulted in the course of a day, sometimes in six or eight hours. In only 4 of 5 cases was fever present or the patients obliged to remain in bed for several days. In 25 cases, however, there was evident endometritis, which proportion would show some relation to the operation. It was strange that no septic troubles arose, as no special care was taken either of the syringe or the solution used. Vibert (Jour. de Méd., Feb. 26, '93).

Case of criminal abortion by a laminaria tent which could not be withdrawn by the patient after introduction, ending in death. J. H. Brauhaus (Maryland Med. Jour., July 2, '92).

Literature of '96-'97-'98.

Case of criminal abortion by the use of a tupelo tent in which the latter had been forced through the uterine walls. The tent was found lying transversely in Douglas's *cul-de-sac*. Supravaginal hysterectomy performed, on account of the septic condition of the pelvic cavity. The perforation, beginning at the internal os, extended obliquely upward and the tent had been forced through the serous coat just below the left horn of the uterus. W. Easterly Ashton (Med. Bull., July, '97).

Opinion recorded as to liability of person who consents to have abortion per-

formed upon her: The judge, when summing up in the Collins trial, decided that "the woman who submits herself to an unlawful operation is guilty of felony just as much as the agent she employs." Editorial (Ga. Jour. of Med. and Surg., Sept., '98).

Death may ensue without the production of traumatism, during the intra-uterine use of instruments, probably through the intermediary of the sympathetic system.

Sudden death of a woman who was four months pregnant, and became violently ill after the introduction into the cervix of the nozzle of an ordinary vaginal syringe, with which injection of an infusion of some herb was made in order to cause the abortion. Before any injection was made, she lost consciousness, and died in a few minutes. At the autopsy the membranes were found to be intact and the uterus uninjured. Vibert (Jour. de Méd., Feb. 26, '93).

Literature of '96-'97-'98.

Case of sudden death during attempted abortion while introducing the nozzle of a syringe into the os uteri. Judicial inquiry. No uterine abnormality found, although the cervix was soft and patulous. Death seemed to be due simply to syncope from a stimulus arising in the uterus. It was a phenomenon of inhibition. Syncope has been observed after passage of the sound. De la Touche (Sem. Gynéc., June 23, '96).

Case of sudden death from air-embolism following an attempt at abortion. At the autopsy the right ventricle was found to be filled with air and blood churned together. The pregnancy was ten weeks advanced, no bacteriological examination made, but the short interval between the decease and the necropsy (six hours) would seem to preclude the participation of these germs. L. J. Mitchell (Medicine, Feb., '96)

A. Lutaud,

Paris.

ABSCESS.—Lat., *abscessus*, from *abscedere*, to depart.

Definition.—A collection of pus in an adventitious cavity, the result of an acute, circumscribed inflammation due to infection with pus-forming microbes.

Varieties.—An abscess may be *acute*, or *warm*, when due to pus-microbes only: staphylococci, streptococci, and others; *chronic*, or *cold*, when due to a specific microbe, especially that of tuberculosis.

Abscesses have been classified according to:—

1. *Etiology.*—Atheromatous, embolic, fæcal (stercoraceous), lymphatic, metastatic, miliary, ossifluent, puerperal, pyæmic; residual symptomatic, or congestive; tropical, tubercular (strumous, or scrofulous), etc.

2. *Pathology.*—Acute, or warm; canalicular; caseous; chronic, or cold; critical, diffuse, gangrenous (anthrax), ligneous, perforating, phlegmonous, etc.

3. *Location (Organ or Tissue Involved).*—Alveolar (gum, jaw, teeth), of antrum, of axilla, bone (subperiosteal), brain (cerebral, cerebellar), bursal, corneal (hypopyon), deep, dorsal, follicular, hepatic, of hip-joint, iliac, ischio-rectal, lacunar, lumbar, mammary (milk; weid, or weed; breast), marginal, mediastinal, meningeal (extradural, subdural), of middle ear, of neck, nephritic and perinephritic, of nose, of palate, palmar, of pancreas, pectoral (empyema), perityphlitic, popliteal, of prostate, psoas, rectal, retropharyngeal, of skin (furunculosis), of scalp, of space of Retzius (properitoneal cavity); spinal, or vertebral; of spleen, superficial, thecal, urethral and periurethal, vulvo-vaginal (Bartholinian), etc.

All the above varieties will be considered under their respective anatomical heads.

Acute, or Warm.

Symptoms.—An abscess may either be superficial or deep. When it is superficial the local symptoms predominate; when it is deep the general symptoms are generally the most marked.

The pain, due to compression of the nerves by the disturbed tissues, varies in degree with the density of the parts involved, the local supply of sensitive nerves, and the tension produced by the inflammatory products. In superficial abscess the pain is generally localized in the centre of the swelling, and is sharp and lancinating; in deep abscess it is more diffuse and dull.

Redness is due to engorgement of the local blood-supply, and the swelling to the inordinate distension of the vessels and the secondary escape of blood-plasma, colorless corpuscles, etc., into surrounding tissues. It may become very great in regions such as the lids, the lips, etc., in which the cellular tissue is lax. As the purulent foci run together and form a single cavity, the centre of the tumefaction becomes soft, and darker in color, and the abscess is said to be "pointing."

Œdematous infiltration in superficial abscess denotes the presence of pus; in deep abscess subcellular œdematous infiltration is an important sign of deep suppuration.

Local heat, throbbing, and tension are mechanical results of the causes of tumefaction tending to decrease as the formation of pus progresses.

Hyperpyrexia is in relation with the location of the abscess, the ease with which the pus-microbes can enter the circulation, and the amount of pus and necrotic tissues present. In superficial abscess there is but little rise of temperature, but in deep abscesses it sometimes reaches 104° F. (40° C.) at the time the wall of granulation tissue is established. A remission of about one degree each morning usually takes place. When the pus has found an issue, or has become completely surrounded by the limiting membrane, the intensity of the fever is usually reduced.

In a superficial abscess, if a chill occur, it is usually very slight, and appears between the fourth and the eighth day. It indicates the formation of pus. In a deep abscess a chill generally occurs, lasting from a few moments to half an hour.

> [Chills are probably due to the influence of infected blood upon the medulla. C. Sumner Witherstine.]

Fluctuation is generally obtained when the purulent focus has been formed. A sharp localized pain, on pressure over the apex of the swelling, obtained at this time supports the likelihood that pus is present, but fluctuation is liable to be a misleading symptom.

> [Aneurisms and soft neoplasms have been punctured through erroneous interpretation of its meaning. The popliteal space, the axilla, and the neck are especially dangerous in this particular. C. Sumner Witherstine.]

Interference with motion or the normal functions of a part is sometimes produced through the proximity of the abscess.

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Variety of chronic abscess (ligneous phlegmon) which formed between the two sterno-mastoid muscles. In the case reported the disease first manifested itself by a soreness in the throat, followed by a swelling of the neck, which continued for four months before aid was sought. The patient could not button his collar.

Examination in these cases reveals a hard swelling of the consistency of the "*squirrhe en cuirasse*" of Velpeau (cuirass-like scirrhus), and of smooth, even

surface, resembling a hard sarcoma. The special characteristics are slow formation, very great hardness and dark color of the formation (no objective difference between it and malignant tumors of the skin), and the typical progress of the disease,—isolated abscesses which open one after another, thus causing the disease to persist for months. A pseudo-diphtheritic bacillus of low virulence is found in the tissues and secretions. The patient becomes cachectic. Réclus, Monod, Quénu, and Reynier deny any specific character to this form of phlegmon. The serum of Roux is advised in these cases, but improvement is very slow at best. Réclus (Bull. de la Soc. de Chir., vol. xxii, Jan. 15, '97).

Etiology.—Inflammation due to traumatisms and lesions of all kinds, especially the introduction of foreign bodies under the epidermis, are the usual causes of abscess. While blows do not apparently produce superficial lesions in the majority of cases, the fact remains that an invisible abrasion may be present and serve as a channel for the introduction of the pyogenic organism. The cutaneous glands, through weakened local resistance, may also become the transmitting media. Any cause removing the epithelial layer of the mucous membrane may also form the primary etiological factor of an abscess in the membrane or in the submucous connective tissue. Abscesses also arise in connection with the various septic fevers.

Pathology.—While several varieties of micro-organisms are found in the pus of an acute abscess, staphylococci and streptococci are by far those most frequently observed, the former being usually found in circumscribed abscess and the latter in diffuse ones. The first step in the process is increased rapidity of the flow of blood in the part, the vessels becoming engorged and dilated. This is succeeded by slowing of the current and passage through the vascular walls and into the surrounding tissues of colorless corpuscles (leucocytes), a few red corpuscles, and blood-plasma, the latter of which become coagulated and finally softened. One or several cavities are thus formed; but, if the cavities are multiple, the barriers usually soften and a single focus is established. The pus is composed of the corpuscles which perish in the cavity thus formed, the broken-down remains of tissue, and the plasma. At a distance from the location of the abscess the circulation is normal, but, as the diseased area is approached, the slowing of the blood-current becomes gradually more evident, until a zone of living leucocytes is met, forming a protective barrier around the abscess-cavity. The surrounding parts also become permeated with new vessels and a zone of granulation tissue (the pyogenic membrane of older writers) is formed. The spread of the suppuration being thus checked, the pus is forced to the surface because it finds the least resistance in that direction; but, if an aponeurosis or fascia interfere, it burrows until an exit is found.

The rôle of the white corpuscles (leucocytes) has been interpreted in various ways; Cohnheim considered them as elements of repair; others have attributed to them the rôle of scavengers. The prevailing theory at present, however, is that of Metschnikoff, who considers them able to attack and destroy invading organisms. The process is termed by him *phagocytosis*, the cells being called phagocytes (*φαγω*, to eat, and *κυτος*, a cell).

The dead leucocytes in pus must be looked upon as the cells that have been brought up rapidly to interfere with the spread or diffusion of the products of the micro-organisms; a large number of these cells coming in contact with the

poison in a concentrated form may succumb to its action; but before doing so they are able to deal with a certain quantity of the poisonous material, breaking it down and rendering it inert. Other cells are constantly being brought up to assist these, until, at length, the bacteria are completely hemmed in. They live for a short time on the dead tissues; but, being localized by the barrier of leucocytes, they ultimately die, either from inanition or because they are poisoned by their own products. It is found very frequently on opening an abscess that no organisms can be seen, those that were originally present appearing to have undergone degenerative changes and to have been taken up by the phagocytes, or devouring cells. (Sims Woodhead.)

Differential Diagnosis. — Fluctuation only indicating the presence of fluid, the presence of this sign without the other symptoms mentioned should inspire great circumspection, especially if surgical measures are to be resorted to.

Aneurism is the most dangerous condition to fear. Its less acute history, and the thrill and its expansile pulsation, can only exist in close proximity to a large vessel.

Certain semisolid growths may simulate an abscess. When the possibility of an aneurism has been eliminated, a fine trocar or exploring needle, if carefully used, will determine the diagnosis.

Prognosis.—This depends upon the general health of the patient. In the robust, a suppurative process usually reaches the stage of resolution without giving rise to complications. In individuals weakened by disease, hereditary or acquired, an abscess may be protracted and exhaustive, and diffusion is more likely to occur if resisting tissues interfere with the superficial evacuation of the pus. Deep abscesses are especially prone to become protracted through this cause, the resistance of muscular aponeuroses, etc., forcing the pus into the cellular interstices. Fistulous tracts, or large suppurative areas, are thus created, and the patient may succumb to blood poisoning or asthenia.

Treatment.—*General Measures.*—Rest and elevation of the affected region, if possible; salines, if purgation is necessary. Easily assimilable food, but not low diet; avoidance of stimulating beverages, alcohol, coffee, etc.

Internal Remedies.—If the case is seen early the suppuration can sometimes be arrested by the use of one of the following agents, supplemented by one of the local applications: Tincture of aconite, 1 to 3 drops every hour, closely watching the patient's pulse; tincture of veratrum viride, 1 drop every hour until the pulse becomes slower, the skin moist, and slight nausea is experienced. Calcium sulphide (sulphurated lime), $^1/_{10}$ grain every hour; or

℞ Sulphate of quinine, 1 grain.
Ext. of nux vomica, ¼ grain.

For one pill; to be taken every three hours.

External Remedies.—The surface is carefully cleansed with antiseptic soap and sprayed with a 2-per-cent. carbolic-acid solution, or with hydrogen peroxide, every two hours, the atomizer being used for ten minutes at each sitting. (Verneuil.)

Compresses dipped in hot 1 to 4000 corrosive-sublimate solution are very effective.

If the abscess is located upon an extremity, a 1 to 4000 corrosive-sublimate solution may be employed in the form of a bath for the limb, the latter being left in the solution several hours at a time.

A solution of nitrate of silver (30 grains to the ounce) may be applied frequently with a camel's hair pencil.

Tincture of iodine may be applied in the same manner every three hours.

When the surface becomes very tender, belladonna ointment may be rubbed in every two hours.

In abscesses characterized by very severe pain a 10-per-cent. solution of cocaine may be introduced by cataphoresis, the anode sponge of a galvanic battery being applied to the part. The sittings should last five minutes, and be repeated every three hours, the current not exceeding 5 milliampères. During the intervals warm fomentations—with borated, camphorated, or pure water—are of great value.

Literature of '96-'97-'98.

Pads of gauze wrung out of hot boric-acid solution (an ounce to a quart of water), applied as hot as the patient can bear them, and well covered with oiled silk to keep in the heat and moisture, are the best; wherever applicable, as with the hands or feet, the inflamed part should preferably be submerged every hour for a period of five to ten minutes in the hot, boric solution itself. James Stuart (N. Y. Med. Jour., Jan. 16, '97).

Surgical Measures.—If suppuration cannot be avoided, the abscess should be opened as soon as an adequate quantity of pus has formed to constitute an abscess sufficient in size to be recognized by the surgeon as such (Senn), or as soon as the presence of pus has been determined by the exploring needle or syringe.

If a local anæsthetic is necessary, one of the following may be used: Twenty drops of a 1- to 5-per-cent. solution of cocaine introduced subcutaneously near the abscess; ether sprayed over the seat of the abscess until local numbness is experienced; chloride-of-methyl or chloride-of-ethyl vapor. The latter is especially efficacious; the parts turn white when ready,—generally in about two minutes. Seltzer-water spurted over the surface may be used to advantage when none of the other agents can be obtained.

To open an ordinary abscess a single small incision suffices; but, if it is large, several small incisions should be made to render perfect evacuation of its contents possible by drainage. If the abscess is superficial, the skin alone should be cut, but if it is deep seated the skin and fascia should be incised and the grooved director, or the points of a pair of forceps, used to reach the pus, the opening being kept patent with forceps. The cavity is then thoroughly emptied and syringed out with 1 to 4000 corrosive-sublimate solution until the fluid comes out perfectly clear. Pressure with the fingers is to be avoided. The incision and its surroundings are then carefully washed with the same solution, and an aseptic drainage-tube inserted. The wound is dusted with iodoform or dermatol, and an antiseptic dressing is applied, exerting slight pressure with bandage. If the abscess is deep, the drainage-tube should be shortened daily; if it is superficial, the drainage-tube can be withdrawn the second or third day.

Literature of '96-'97-'98.

The general way in which dry iodoform gauze is packed indiscriminately into and around every abscess-cavity or suppurating wound is irrational. Dry iodoform gauze does not drain pus, it only drains serum, being hæmostatic and checking oozing; again, it invariably adheres to and imbeds itself into the edges of the wound, penning up the pus and acting like the stopper to a bottle, while the pus keeps on accumulating.

The opening made should be packed and kept open with wet, bichloride gauze,

to be followed by hot fomentations of boric acid, which will, in the majority of cases, prevent suppuration. James Stuart (N. Y. Med. Jour., Jan. 16, '97).

Thirty-two cases of abscess treated by the Otis method: The skin about the affected area is scrubbed with green soap and washed with sulphuric ether and then with bichloride (1 to 1000). A narrow bistoury is then inserted into the abscess-cavity, and the contents gently, but thoroughly, squeezed out; the cavity is irrigated with bichloride (1 to 1000) and immediately filled to moderate distension with warm iodoform ointment (10-per-cent. iodoform and vaselin), care being taken not to use a sufficient degree of heat to liberate free iodine. An ordinary glass gonorrhœal syringe is used, the plunger being removed, and the barrel warmed in the flame of an alcohol-lamp and filled with ointment by means of a spatula. On finishing the injection, at the instant of withdrawing the syringe from the wound, a compress wet with cold, bichloride solution is applied, which instantly solidifies the ointment at the orifice, preventing the escape of that into the abscess-cavity. A large compress of sterilized gauze is then applied by means of a firm spica. The patient is told to return in four days, when, if all is well, the dressing is reapplied; but, if any evidence of inflammatory action is found the wound is thoroughly irrigated and cleansed and the injection repeated. It is simple and safe; the patient is not prevented from going about. It leaves no scar. Edwin M. Hasbrouck (N. Y. Med. Jour., June 13, '96).

Cold, or Tuberculous.

Symptoms. — These abscesses frequently attain a large size, and last for months without their presence being detected. Besides failing general health, the symptoms of the causative trouble are the only prominent ones. The spine, the hips, the genito-urinary tract, and the lymphatic glands are the organs most prone to tuberculous disorders giving rise to cold abscesses. They sometimes appear several months and even years after the beginning of the primary disease.

No pain is experienced, as a rule; cold abscesses are not even tender to the touch. There is no redness until the abscess is about to break, the focus of the liquid mass being otherwise too deep-seated.

Slight hyperpyrexia is usually present. There is no local heat; hence the name "cold" is given this form of abscess by the Germans, to differentiate it from the "warm" abscess.

The above symptoms are usually followed by the sudden appearance of a swelling. Though generally soft, it may be hard, and suggest a tumor in the vicinity of the spinal column (Pott's disease), above or below Poupart's ligament, after burrowing along the psoas muscle (psoas abscess), on the inner aspect of the thigh, or in the lumbar region (lumbar abscess), etc. In the neck cold abscesses are usually due to disease of the neighboring cervical lymphatic glands. The skin either remains normal or gradually becomes thinned and softened until an external opening is formed.

Fluctuation, usually detected with ease, is sometimes hidden by a thick investing layer of lymph, which gives the mass a peculiar tension, suggesting a lipoma or some other hard growth. Aneurisms sometimes convey the sensation produced by a cold abscess,—a fact to be borne in mind when operative procedures are under consideration.

Pathology.—A cold abscess can always be traced to a specific inflammatory process, and almost invariably to one of a tubercular nature. Where the confluent masses in the centre of a nodule begin to break down, there is formed a collection of material surrounded by tuberculous tissue. This material be-

comes infiltrated with leucocytes, and thus is produced a cavity containing fluid fatty material, fragments of cells, and leucocytes, around which there is granulation tissue filled with tubercles. In this way a tuberculous abscess is formed. (Cheyne.) It seems at times to be quite a matter of accident whether the abscess breaks into the joint or finds its way by a more circuitous route into the surrounding connective tissue. As the tuberculous masses spread, caseation takes place at different points in the wall, and the masses are discharged into the cavity of the abscess; but the spread of the abscess is effected generally by what is termed "burrowing of pus." This burrowing occurs in various directions, and large collections of pus, altogether out of proportion to the original lesion, are formed, and are known as cold abscesses. (Warren.)

What has been called a chronic abscess is very often no abscess at all. In tubercular processes the product of tissue-proliferation undergoes coagulation-necrosis, and disintegrates into a granular mass, which, when mixed with a sufficient quantity of serum, forms an emulsion that microscopically resembles pus, but under the microscope shows none of the histological elements which are found in true pus. An abscess can only be called such if it contain pus. A true chronic abscess can originate in a tubercular, actinomycotic, or syphilitic lesion, when the granulation tissue is secondarily infected by the localization of pus-microbes, which convert the embryonal cells into pus-corpuscles. (Senn.)

Differential Diagnosis.—The concomitant disorder usually makes a diagnosis easy in a case of cold abscess; but occasionally the swelling is the only indication of ill health, and it is important to determine, under such circumstances, the nature of the pus. The macroscopical appearances of "laudable" pus and of "sanious" pus are frequently so similar that a *de visu* diagnosis is not justified. Bacteriological examination of the contents of such abscesses will show conclusively whether they are true pus-containing abscesses or whether or not they are pseudo-abscesses. If cultivations are made of their contents, pus-microbes will grow upon proper nutrient media if it be a true abscess, while, from the contents of a pseudo-abscess only the microbes of the primary infection can be cultivated. The information obtained by the discovery of the essential cause can be confirmed by inoculation experiments. (Senn.)

Prognosis. — The walls of cold abscesses are usually tense and tough, and are lined with cheesy tuberculous material. They do not tend to collapse, as is the case with acute abscesses, and for that reason are healed with difficulty. When, however, the seat of the original trouble can be reached and successfully treated, the fluid in the parts of the abscess-tract is absorbed, and the caseous matter undergoes calcification. This fortunate issue of the case is seldom met with, however, and the abscess usually continues, the primary etiological factor acting as a drain for the diseased area. The prognosis, therefore, depends upon the result obtained in the treatment of the latter.

Treatment.—It is a well-known clinical fact that, when such a cold or tuberculous abscess opens spontaneously, or is incised in a careless way, profuse suppuration and hectic fever follow, with only too often a speedy fatal result from septic infection. Unless the surroundings of the patient admit of carrying out the antiseptic treatment to its full and perfect extent, a chronic abscess should

not be evacuated by incision. It should be aspirated. When an incision can be made, it should be free, and the cavity should be thoroughly curetted, cleansed, disinfected, and iodoformized, then sutured, drained, and treated as a recent wound.

On general principles, necrosed or detached bone should be looked for in all cases. Strict antiseptic precautions are imperative to avoid mixed infection (bacilli of tuberculosis and pyogenic cocci). Preliminary precautions should be taken to meet violent hæmorrhage due to vascular erosion.

When there is local inflammation and spontaneous opening of the abscess is probable, there should be a free incision, a thorough scraping of its walls with Volkmann's curette to transform the suppurating surfaces into bleeding ones. The cavity is then cleansed with a 5-per-cent. solution of carbolic-acid, a long drain is applied, and the wound is stitched as far as the drain. An antiseptic dressing is then applied. (Volkmann, Trélat, Pozzi.)

Literature of '96-'97-'98.

Of the methods commonly used in opening these abscesses,—aspiration with irrigation, free incision with curetting,—all seemed to give inferior results to those obtained by simple incision in most dependent portion, with the least possible interference with the walls of the abscess. Homer Gage (Boston Med. and Surg. Jour., Sept. 10, '96).

After opening the abscess the cavity may be washed out with peroxide of hydrogen in 10-per-cent. solution or packed with iodoform gauze. Removal of the limiting sac is then performed by decortication, the steps being: free incision, the sac detached with finger or spatula and removed, and the cavity closed immediately. (Lannelongue.)

The removal of the limiting sac is facilitated by filling the wound with paraffin; the mass can then be removed as if it were a lipoma. (Cazin.)

A psoas abscess should be opened in the loin and groin when possible. In the loin the incision should be made through the external and internal oblique, transversalis, and lumbar fascia, along the outer edge of the erector spinæ to the edge of the quadratus lumborum. The latter muscle and the transversalis fascia are divided on a level with the tip of the second or third lumbar transverse process, avoiding the lumbar arteries. The sheath and the psoas are then perforated with the finger or a trocar. A counter-opening is then made below Poupart's ligament to form a tunnel, into which a large-size drainage-tube is inserted. This is replaced, later on, by a tube at each end to obtain obliteration, beginning from the centre of the canal. If one incision is preferred the loin should be selected.

Aspiration and Injections.—When no local inflammation indicates that the abscess is soon to open, the fluid may be withdrawn with a large aspirator; a 5-per-cent. solution of carbolic-acid is injected and then aspirated. This procedure is renewed until the solution withdrawn is perfectly clear. A Lister bandage is then applied, insuring slight pressure. Five days later the treatment is renewed. About five sittings are required. (Bœckel.)

Injection fluids: Iodoform, 1 part; ether, 5 parts; distilled water, 5 parts. Injection not to be renewed while iodoform is being excreted in the urine. (Mosetig-Moorhof, Verneuil.)

Less painful is a mixture of 1 part of iodoform to 10 of glycerin (Billroth) or of olive-oil (Bruns).

Intoxication may be prevented by

sterilizing the iodoform and excipient (except ether) by heating at 212° F. separately. (Tillmann.)

Boric acid, a 4-per-cent. solution, may be used as above (Ménard), or naphthol and camphor, 1 part each. About thirty sittings are usually required.

The lesion being a tuberculous one, the general system should be treated accordingly. Nutritious food, including a free supply of milk and eggs, pure air, sunlight, and sea-air, if possible, are indicated, as well as tonics and alteratives (codliver-oil and hypophosphites, iodine, iodides, arsenic, quinia, strychnia, etc.).

C. Sumner Witherstine,

Philadelphia.

ABSINTHIUM (WORMWOOD).—Absinthium (the *Artemisa absinthium* of Linné) is a fruit-bearing plant growing in the northern latitudes of Europe, Asia, and Africa, and naturalized in North America. It grows in dry ground and is often found along roadsides. The leaves and tops are utilized in pharmacy, and contain a volatile oil and other constituents, — absinthol, absinthin, etc. The preparations usually employed are an infusion and the powdered leaves.

Dose.—Volatile oil, 1 to 2 minims; infusion, 1 to 2 drachms; powdered leaves, 20 to 40 grains.

Physiological Action. — Absinthium especially affects the central nervous system, and there is a striking resemblance between its toxic effects and a paroxysm of idiopathic epilepsy,— namely, twitching of the muscles of the face and ears, followed by clonic and tetanic spasms of the muscles of the trunk and extremities, with salivation, cries, involuntary emission of urine, and finally a period of unconsciousness.

Experiments demonstrating that absinthium has an action upon the whole central nervous system. Robert Boyce (Brit. Med. Jour., Nov. 18, '93).

A cordial—"absinthe"—is extensively used in France as a supposed stomachic tonic and as an intoxicating agent. It surpasses in perniciousness any beverage known, and contributes markedly to the deterioration of that country's population.

The proper designation for absinthism should be "anisism"; if the anise-seed be eliminated from the liqueur, the latter will be found non-toxic. Oil of wormwood possesses antiseptic properties to a marked degree. Cadéac and Albin Meunier (Lyon Méd., July 28, '89).

Report of a commission of the Paris Academy of Medicine to examine into the statements made by Cadéac and Albin Meunier: "1. Absinthe is, of all the essences in the liqueurs of that name, the most toxic and dangerous, and it alone produces the epilepsy of the absinthe-drinkers. 2. It is an error, scientifically and practically, to give the titles 'beneficent' and 'corrective' to absinthe essences. 3. Absinthe-liqueur, and all liqueurs of the sort, said to be aperient, and, above all, the non-purified and adulterated alcohols, constitute poisons markedly prejudicial to health. 4. Absinthism and alcoholism constitute the two great enemies to public health and the improvement of the human race." Ollivier and Laborde (La Sem. Méd., Oct. 2, '89).

Absinthe Poisoning. — As already stated, a poisonous dose of absinthe gives rise to symptoms simulating an attack of epilepsy. In a fatal case there is abolishment of the reflexes, anuria, and finally arrest of respiration and of cardiac action.

Literature of '96-'97-'98.

Autopsy of case in which death had followed the ingestion of one and a half pints of pure absinthe. The liver contained 0.21 of 1 per cent. of alcohol, the blood 0.33 of 1 per cent., and the brain 0.44 of 1 per cent. The epithelium of

the stomach and that of the kidneys were desquamated. The mucous membrane of the stomach and the renal blood-vessels were very much congested. The stomach presented evidence of hæmorrhage in the larger curvature. Symptoms attributed more especially to alcohol, the characteristic effect of absinthe being the production of epileptiform coma. Pauly and Bonne (Gaz. Hebd. de Méd. et de Chir., May 13, '97).

Absinthe is not only an epileptogenic poison, but also a stupefying principle, which would add its action to that of alcohol. Lépine (Gaz. Hebd. de Méd. et de Chir., May 13, '97).

Treatment of Poisoning.—Lavage of the stomach should at once be resorted to even if the respiration, the cardiac action, and the reflexes are apparently abolished.

Therapeutics.—Absinthium was at one time used as antispasmodic, febrifuge, and anthelmintic. It has been generally discarded, however, and is only considered here owing to its present rôle as an intoxicant.

A. C. E. MIXTURE. See CHLOROFORM.

ACETANILID.—Acetanilid (formerly known under the name of *antifebrin*) is a white crystalline powder obtained by the action of glacial acetic acid upon aniline. It is odorless and gives rise to a slight burning sensation when applied to the tongue. It is but slightly soluble in water, but completely so in alcohol and ether.

Dose and Physiological Action.—When the drug was first placed on the market, some years ago, the doses administered were excessive. The normal dose in the healthy adult should not exceed 7 grains; 4 grains represent the proper quantity to be administered at a time.

To give antifebrin in doses of 5 and even 10 grains, still more to repeat these after a short interval, is a highly-injudicious procedure. Such doses are excessive, being equivalent to about 25 and 50 grains of antipyrine. This fact of its greater strength has been overlooked. Therapeutic Committee, British Med. Assoc. (Brit. Med. Jour., Jan. 13, '94).

Literature of '96-'97-'98.

Death from the effects of an advertised remedy for headache known as "Daisy Powders," and containing mainly acetanilid. In the "British Pharmacopœia" the dose is stated to be from 3 to 10 grains,—a dangerous dose, as was pointed out by the Therapeutic Committee of the British Medical Association in 1894. The injury expressed the opinion that the powders had been dispensed with great negligence; it is equally evident that the sale of the article by any but competent chemists ought not to be permitted. Editorial (Brit. Med. Jour., July 11, '96).

For children the dose should be small, but it need not be reduced to quite the proportion observed for most drugs.

The action of acetanilid upon the heart may become pronounced unexpectedly; its effects should therefore be closely watched in children and weakly individuals.

Acetanilid used in 1100 cases of diseases of children, in 600 of which a record was kept. Conclusions are: (1) with due care, it is a reliable remedy for infancy and childhood; (2) the results are of longer duration and the depression not so great as from the use of antipyrine; (3) the cyanosis which may accompany its use is not dangerous and soon passes away; (4) small, but repeated doses should be used. I. N. Love (Jour. Amer. Med. Assoc., Mar. 29, '90).

Fatal case, in a child, from the administration of 3 $^{1}/_{6}$ grains every two hours during the day. By evening the child was cyanosed and in fatal collapse. Editorial (Provincial Med. Jour., Mar. 1, '89).

[Several instances of alarming toxic

symptoms following the administration of acetanilid to children have been reported during the past year; but, as a rule, they have been the result of either too long continued administration after the fall of temperature began or of a dose out of proportion to the age of the child. Most authors agree in considering the drug a good and safe antipyretic for use in childhood. The number of cases reported during the last year of the occurrence of uncomfortable or alarming symptoms, out of all proportion to the dose employed, shows that there exists in some people an idiosyncrasy to the action of the drug. GRIFFITH and CATTELL, Assoc. Eds., Annual, '90.]

Case of collapse occurring after a dose of 3 grains. The same dose had been given eight times in the four preceding days without evil result; possible instance of cumulative action. Kronecker (Ther. Monat., Sept., '88).

Case in which sudden death followed the eighth administration of 15 grains of the drug. Extraordinary rapidity of subsequent coldness and rigidity noted. Hardy (Brit. Med. Jour., Mar. 24, '88).

Case of a young woman who took 4-grain doses of the drug at frequent intervals, until, in three days, 48 grains had been taken. On the third day the patient suddenly fell from her chair, unconscious and cyanosed.

The prolonged use of acetanilid is certainly not without danger. This may be of two kinds: 1. The production of marked and more or less transient changes in blood-composition from its long use. 2. Cumulative power in the drug. Robert Haley (Weekly Med. Review, Nov. 9, '89).

Literature of '96-'97-'98.

In last six or eight months five or six cases of thrombosis in lower extremities caused by use of acetanilid. Great weakness of heart in all forms of continued fever should deter one from using powerful sedatives. L. H. Cowden (Med. Summary; Homœo. Recorder, May 15, '98).

Its prolonged administration, even in small doses, may give rise to sudden and marked anæmia and to temporary mental aberration. Experiments in animals have shown that prolonged use tends to cause fatty degeneration of the heart, liver, and kidneys.

Report of twenty-five physicians of New South Wales. Opinion that symptoms of depression and collapse are more readily produced and are more marked than with antipyrine may be explained by the fall of temperature being greater and more rapid. Most of the reports mention cyanosis to a greater degree that after antipyrine. Anæmia may be induced by its continued use and become a grave condition. D. R. Paterson (Practitioner, No. 304, '93).

Two cases in which gradual loss of memory was produced by long continued administration (5 to 30 grains) of acetanilid. Memory regained by stopping the drug. Joseph Haigh (Medical World, Oct., '89).

Acetanilid Poisoning. — Acetanilid gives rise to severe symptoms of intoxication more frequently than any other agent belonging to the aromatic series, with the exception, perhaps, of antipyrin.

When poisonous doses are taken, there is marked cyanosis, prostration, shallow and labored respiration, palpitation of the heart, weak and thready irregular pulse, dilatation of the pupils, cold extremities, subnormal temperature, cold sweats, and other symptoms of collapse. The drug would therefore seem to be a depressant to the functions of respiration and circulation, with disturbance of the vasomotor system and probably of the heat-regulating centres.

Case of poisoning by acetanilid, in a lady 36 years of age, who had taken about 40 grains in divided doses, in the course of four hours. The chief symptoms exhibited were semi-unconsciousness; delirium; a very feeble pulse; short, rapid breathing; cyanosis of face and lips; and cold extremities. The patient recovered under the use of alco-

holic stimulants and the hypodermic injection of strychnine. J. W. C. (Med. Review, May 21, '92).

Case of poisoning by a single dose of 62 grains of acetanilid. The symptoms were excessive vomiting, superficial and slow breathing, and a cyanotic face. Later on the the pupils were dilated, there were gnashing of the teeth, nervous twitching, delirium, and coma; eight hours later the patient became conscious, but complained of pain in the stomach. In two days she was able to leave her bed. E. Fürth (Wiener med. Presse, Apr. 21, '89).

Case where about 7½ drachms were taken with suicidal intent. Among other symptoms were albuminuria and hæmoglobinuria. Recovery. Jacob Wolff (Deusche med.-Zeit., June 16, '90).

Case of a man who took, by mistake, 17 fluidrachms of a mixture containing 1 part of acetanilid in 6 parts of compound elixir of taraxacum. Recovery ensued, although the patient exhibited the most profound symptoms of cardiac and respiratory depression. W. R. Allison (Medical Analectic, Jan. 31, '89).

Case which had taken 2 teaspoonfuls of antifebrin on an empty stomach. Four hours later, pulse, 84; temperature, 36.4° C. (97.5° F.); lips, fingers, and toe-nails blue; livid complexion; pupils contracted, and sensation undisturbed. Collapse, lasting three and one-half hours. Out of danger fourteen hours after taking the acetanilid. The intravenous injection of common salt seemed to give the best result. J. Vierhuff (St. Petersburger med. Woch., Apr. 21, '90).

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Case in a woman, aged 21 years, who, two weeks after her confinement, was given, for headache, ½ ounce of acetanilid in bulk in an envelope, with directions to take a small quantity of it on the end of a teaspoon every two hours. The patient took two doses as directed, and a few hours afterward, the headache still persisting, she concluded that a very large dose would be more efficacious, and swallowed a teaspoonful of the drug. Half an hour later weakness and dizziness, and an hour later she fainted and passed urine involuntarily. Later on she became cyanotic and semiconscious. The pulse was slow and extremely feeble, the respirations slow and shallow, the forehead bathed in sweat, and the face livid and perfectly expressionless. The tongue, lips, and finger-nails were intensely cyanotic and almost black; the head, hands, and eyelids were cold, but her feet were quite warm; temperature was normal; there was tingling of the skin over the entire body and some slight mental confusion. There was suppression of urine until noon the next day, and when passed it was of a dark-brown color and very abundant. Loud and continuous borborygmus noticed. The milk secreted by the breast was very much thinner than it had been before the poisoning. The cyanosis lasted for several days. Treatment was that advised by Hare: Patient forced to maintain a recumbent position, the head kept low, and an hypodermic injection of aromatic spirit of ammonia followed by sulphate of strychnine and sulphate of atropine given. Hot bottles placed about the body, and $^1/_{60}$ grain of strychnine every three hours given by the mouth, alternating with whisky and aromatic spirit of ammonia. Owing to the condition of the milk, it was not considered wise for the patient to continue nursing her child, as the milk failed to return to its normal condition after recovery, and the patient was much exhausted. G. Baringer Slifer (Ther. Gaz., May 15, '97).

While subnormal temperature may result from the administration of even small doses, it is not always present in cases of poisoning.

> Subnormal temperature, in a man aged 40 years, produced by a second dose of 7 grains two hours after the first. T. M. Dunagan (Memphis Med. Monthly, Mar., '91).
>
> Cyanosis and oppressed breathing produced without reduction of temperature, in a case of blood-poisoning. C. Klippel (Kansas City Med. Record, Dec., '88).

The cyanosis is probably due to the

liberation of free aniline in the blood, and is more likely to occur when the acetanilid is imperfectly manufactured. An excess of aniline is present when the acetanilid employed gives a reddish-orange precipitate with sodium hydrobromite.

Many of the toxic symptoms of acetanilid so closely resemble those of aniline poisoning as to suggest the production of that substance in the blood. There is a close relationship between the two bodies, and there is therefore some ground to suspect the occasional presence of aniline in samples. Editorial (Brit. Med. Jour., Dec. 22, '94).

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Cyanosis is due to the liberation of free aniline in the blood, which disappears soon afterward, as soon as it is eliminated by the kidneys and skin. A similar cyanosis, though more pronounced, is found in the workmen of aniline-color works. C. F. Bachmann (N. Y. Med. Jour., May 22, '97).

Acetanilid is an effective agent for the treatment of wounds, causing rapid healing in subjects whose powers of resistance to toxic effects are not greatly below par. In infants and aged people, for instance, the possibilities of untoward effects are greater than in youths or adult subjects. Idiosyncrasy may also enter for a share in the cases of poisoning reported. In the aged the resolutive process may be retarded by its use.

Case in an infant, aged 14 months, in whom excision of the hip had been performed for tuberculosis and the wound packed with acetanilid. In four hours the temperature dropped five degrees and there were great pallor and feeble pulse. The temperature rose and symptoms disappeared upon removal of the dressing. The second case was one of extensive suppurative superficial scald. At twelve o'clock 2 drachms of finely-powdered acetanilid was dusted over the surface; at five o'clock the patient presented grave toxic symptoms; all acetanilid was at once removed, digitalis and whisky were exhibited, and by midnight he was in a normal condition. T. S. K. Morton (Phila. Polyclinic, Feb., '95).

Acetanilid is a very effective antiseptic dressing when spread in powder over denuded surfaces. G. Guttmann (Berliner kl.n. Rundschau, Dec. 12, '87).

In retarded healing of the umbilicus good results are obtained from acetanilid combined with starch-powder. Wells (Phila. Polyclinic, June 5, '95).

Case of an infant, 16 days old, suffering from hæmorrhage from the umbilicus. A powder of equal parts of boric acid and acetanilid applied locally twice daily for three days caused the face to become distinctly cyanotic; the lips, ears, finger-tips, and toes bluish; the hands and feet cold; the breathing bordering upon stertor. The condition disappeared on ceasing the application of the powder. R. C. Rosenberger (Phila. Polyclinic, No. 45, '95).

Case of eczema in which dusting-powder, composed of 1 part acetanilid and 3 parts subnitrate of bismuth, was used three times a day. When it became necessary to secure a new supply, the second application produced alarming cyanosis, with labored breathing and other evidences of distress; discontinuance of the powder. Inquiry showed that cyanosis had followed every application of the powder. Charles Sauter (Louisville Med. Monthly, Nov., '95).

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Two cases: an amputation of the ear for epithelioma of the helix and an abscess of the maxillary sinus in elderly men, the one aged 73 and the other 84. Acetanilid seemed to produce a great deal of irritation and to delay granulation; similar experience several times with iodoform. William A. Edwards (Pacific Record, Jan. 15, '96).

In the different classes of wounds, burns, scalds, and amputations, it is not only equal, but superior, in every respect, to iodoform. Wible (Pittsburgh Med. Review, May, 96).

Marked instance in an infant in which

it had been applied to the navel. Face, lips, fingers, toes, and the whole of the skin and visible mucosa of a dark-blue color. Rectal temperature was 99° F.; respiration, 60. Oxygen, whisky, and digitalis were administered. No effect upon cyanosis noticed from the oxygen inhalations. Not until the fourth day did the child regain its former strength and disposition. I. M. Snow (Archives of Pediatrics, June, '97).

While acetanilid forms an excellent dressing for wounds, burns, and exposed surfaces in general, it is easily absorbed by the latter, and may thus give rise to active toxic symptoms, especially in infants.

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Severe case of acetanilid poisoning in a young man of 19 years, in whom the drug was absorbed from an immense burn of the second degree involving the entire back, at least two square feet being affected.

From disuse of the old endermic method of administering medicine, we are apt to forget how much a recently-blistered surface can absorb. Treatment by cardiac and general stimulants, application of heat, and inhalation of oxygen-gas. The acetanilid wiped off with oil and vaselin. E. S. Boland (Boston Med. and Surg. Jour., July 22, '97).

Case of acetanilid poisoning in a child, aged 3½ years, scalded over buttocks, thighs, scrotum, and penis, and dressed with an ointment containing 10 per cent. of acetanilid. About 3 ounces used at the first dressing. Two days later the wound was redressed, some sloughened tissue was removed,—leaving a raw surface,—and 3 ounces of the ointment again applied. Two hours after this application the child commenced to turn blue; this deepened until the skin and mucous membranes were blackish blue. The smaller veins all over the body were prominent. The pulse was over 160 per minute. The temperature subnormal; a profuse sweat covered the body. The extremities were cold, but the respirations were not affected. There were no palsies; the fingers were, however, slightly rigid. Sensibility was not impaired. The treatment consisted mainly in restoratives. Recovery. L. N. Gartman (Phila. Polyclinic, Sept. 18, '97).

Treatment of Acetanilid Poisoning.—In the treatment of poisoning by acetanilid cardiac, respiratory, and vasomotor stimulation is of great importance. Ether, hypodermically, has been most frequently used. Belladonna is probably the best drug to fulfill the indications; it tends to equalize the blood-pressure, and with external warmth and some more direct cardiac stimulant—brandy, etc.—presents the needed qualities for antagonizing the overaction of acetanilid.

Therapeutics.

Fever.—Acetanilid presents the required qualities for the reduction of *high* fever, which alone warrants the use of antipyretics. Not only is a rise of three or four degrees harmless, but modern investigations tend to show that it is one of nature's means of defense against pathogenic elements of various kinds.

Acetanilid in 181 cases of various febrile affections (not including rheumatism). Action especially favorable in children where slight gastric fever or moderate bronchial catarrh had produced decided elevation of temperature. G. Guttmann (Berliner klin. Woch., Dec. 12, '87).

Acetanilid useful only in subduing excessively high temperature, but not in maintaining apyrexia. The duration of the effect is much less than with antipyrin. Demme (Amer. Pract. and News, Feb. 18, '88).

Acetanilid especially valuable when pain and high temperature exist, and when the pulse is full and bounding. M. C. Brasher (Chicago Med. Times, Sept., '92).

Case of a child who had been given aconite and veratrum for ten days, at the end of which time the temperature was 105½° F., with active delirium and typhoid symptoms. A single dose of

acetanilid in two hours reduced the temperature to 99° F., without collapse or strangury. D. Boswell (Medical World, Sept., '94).

Malaria.—It has been found serviceable by several observers in warding off the periodic manifestations of intermittent fever.

Acetanilid possesses great merit in warding off chills in intermittent fever. If there is time, before the chill 1½ to 2 grains of calomel in ¼-grain doses half an hour apart are given; then, according to age, 2 to 6 grains of acetanilid twenty minutes or half an hour before the expected chill. Gentle perspiration with natural sleep usually follow within half an hour; if not, a second dose of equal amount may be given. Used in several hundred cases without quinine. Benjamin Brodnax (North Carolina Med. Jour., Apr. 20, '95).

For chronic malarial poisoning, the following prescription is valuable:—

℞ Acetanilid,
Salol,
Sulphate of quinine, of each, 24 grs.

M. To be divided into twelve capsules. Sig.: One capsule to be taken every six hours. J. W. Hope (Va. Med. Monthly, May, '92).

Typhoid Fever.—Early in its career acetanilid was found more harmful than beneficial in this affection. It tends to depress vital energy, which, on the contrary, should be sustained. Its use in this disease has been practically abandoned.

In typhoid fever it is decidedly harmful; it lengthens the course and intensifies the symptoms. C. Z. Wroczynski (Gazeta lekarska, No. 48, '88).

Profuse sweating tends to increase the depression. Cyanosis of the lips and cheeks sometimes follows. G. Guttmann (Berliner klin. Woch., Dec. 12, '87).

Classes of patients who exhibit susceptibility to the influence of acetanilid. In a number of cases of pregnant and nursing women who were suffering from typhoid fever, disagreeable or alarming symptoms observed to follow the exhibition of any but very moderate doses of the drug. Larger, but still moderate, doses were frequently followed by profuse diaphoresis, or even collapse. Sembritzki (Ther. Monat., June, '89).

Three cases of typhoid fever and one of pneumonia in which, after acetanilid failed to reduce the hyperpyrexia, antipyrin succeeded. W. S. Greene (Univ. Med. Mag., Dec. 22, '88).

Phthisis.—The same reasons cause acetanilid to be contra-indicated in this disease. It has been used to counteract the afternoon rise of temperature, but the advantage gained is more than offset by the depression produced.

Case of a young man, with acute pulmonary tuberculosis, in whom 10 grains produced collapse. James Wilding (Brit. Med. Jour., Sept. 14, '89).

Nervous Disorders.—*Pertussis.*—It is in the diseases of the nervous system that acetanilid has shown itself most valuable. As an antispasmodic in whooping-cough its effects are quite marked.

Case of a child, 5 years old, suffering from pertussis, who took, by mistake, 1 drachm of antifebrin. Cyanosis; respirations slowed. Large dose had an excellent effect on the whooping-cough. Spencer (Canadian Practitioner, Apr., '91).

In pertussis it lessens the discomfort and keeps the paroxysms in check better than any other remedy. I. N. Love (Jour. Amer. Med. Assoc., Mar. 29, '90).

Acetanilid of great value in whooping-cough; ¼ to ½ grain every two hours to infants 1 to 2 months old, and proportionately larger doses to older children. W. L. Wade (So. California Pract., Aug., '94).

Neuralgia and Kindred Disorders.—As an analgesic, especially in cases of neuralgic or neuritic nature, or in pain from reflex causes, acetanilid has been

of marked benefit. In rheumatism, sciatica, lumbago, trifacial and other neuralgias, gastralgia, girdle-pain of locomotor ataxia, ovarian or other visceral pain, the pain of optic neuritis and glaucoma, it has been freely used, and still maintains a well-deserved reputation. It is also effective in the neuralgic pains associated with herpes zoster.

> Serviceable remedy in neuralgia of the cranial nerves, migraine, and rheumatic headache. In other forms of headache it is of less value, and in that of traumatic origin or depending on organic lesion of the brain or its membranes it is entirely useless. S. Merkel (Münchener med. Woch., June 12, '88).
>
> Five-grain doses successfully relieve the lightning pain of locomotor ataxia. Stewart (Canada Med. Record, Jan., '88).
>
> Of great advantage in 5-grain doses, repeated every two hours, in painful menstruation, especially of young girls. H. B. Ely (Medical World, Jan., '91).

Epilepsy.—In epilepsy, however, it has not shown itself effective, even when administered in sufficiently large doses to produce cyanosis.

Vomiting. — Vomiting of nervous origin occasionally yields to its action.

> In obstinate vomiting, particularly when it seems to be due chiefly to nervous disturbance or marked gastric irritability. Two grains every hour until 6 grains are taken often prevent this unpleasant sequel of operative interference. H. A. Hare (Therapeutic Gazette, Nov. 15, '94).

ACETIC ACID.—Acetic acid is an organic acid obtained from vinegar, of which it represents the active principle. It is also obtained from crude pyroligneous acid. It is a clear, colorless fluid having a strong pungent odor and an intensely-acid corrosive taste. It contains 36 per cent. of glacial acetic acid: a monohydrate presenting the physical properties of acetic acid, which, in turn, becomes crystalline at 34° F.

Dose.—The dilute acetic acid is officinally prepared by adding 1 part of acetic acid to 5 of water, and is used as a local astringent and stimulant.

Glacial acetic acid is employed as an escharotic. The crystalline form is mainly employed with sulphate of potassium in the preparation of smelling-salts.

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> Experiments to ascertain whether acetic acid cannot be used instead of alcohol to avoid the dangers of the alcohol habit. Nux vomica, kola, cinchona, sanguinaria, ipecacuanha, and colchicum-seed successfully exhausted with varying strengths of acetic acid. Joseph P. Remington (Amer. Jour. of Pharm., No. 3, p. 121, '97).
>
> The constituents of acetic-acid preparations may be divided into (*a*) those which hasten the evaporation of the acetic acid (this group includes all powdery substances—kieselgur is the most active, then comes kaolin; sulphur and flour have a slighter effect); and (*b*) those which retard the evaporation of the acetic acid (glycerin comes first, then adeps benzoatus, and lastly vaselin). Following preparations of acetic acid recommended:—
>
> 1. Adeps lanæ, 7 parts.
> Acetic acid (30 per cent.), 7 parts.
> Benzoated lard, 7 parts.
>
> 2. Adeps lanæ, 6 parts.
> Acetic acid (30 per cent.), 7 parts.
> Benzoated lard, 2 parts.
> Kaolin, 6 parts.
>
> 3. Glycerin, 5 parts.
> Acetic acid (30 per cent.), 7 parts.
> Kaolin, 9 parts.
>
> Following "acetic-acid-and-sulphur paste" is very useful in acne:—
>
> 4. Adeps lanæ, 6 parts.
> Acetic acid (30 per cent.), 7 parts.
> Benzoated lard, 6 parts.
> Precipitated sulphur, 2 parts.
>
> All these preparations contain 10 per cent. of anhydrous acetic acid, and con-

sequently are strong preparations of the acid. Unna (Treatment, vol. ii, p. 373, '98).

Physiological Action.—In free dilution acetic acid is an excellent antiseptic; but, administered without the admixture of bland liquids, it causes intense irritation, owing to its property of effecting a partial solution of albuminous bodies and of dissolving gelatinous tissues. Acetic acid combines with the alkaline bases within the system, forming acetates that are diuretic and diaphoretic.

Acetic-Acid Poisoning.—The escharotic action of acetic acid, by manifesting itself upon the mucous membrane of the pharynx and larynx, is liable to cause œdema of the glottis: a danger to be at once thought of. The immediate manifestations are severe pain in the mouth, throat, œsophagus, and stomach, with retching and vomiting and other symptoms attending violent irritation of the digestive tract.

Treatment of Acetic-Acid Poisoning.—Alkalies and demulcents should be employed. The bicarbonate of soda in free solution is an effective remedy. Ordinary soap—one containing an alkali—can be used in solution until an alkaline salt is available.

Therapeutics.—As an antiseptic, acetic acid is possessed of considerable power. As such it may either be applied locally or its fumes may be inhaled.

Acetic acid as a disinfectant in a 3- or 5-per-cent. solution replaces carbolic acid and corrosive sublimate for intra-uterine injection. Entirely without danger to the patient. Engelmann (Med. Record, Nov. 24, '88).

Good effects from inhalations of a 2- to 3-per-cent. solution of acetic acid in pachydermia laryngis associated with tuberculosis. Sittings lasting ten minutes three times a day and continued several weeks. Scheinmann (Berliner klin. Woch., Nov. 21, '91).

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Acetic acid an excellent remedy in bronchitis and the broncho-pneumonia of children. Used in forty cases, in the form of inhalations. The acid is placed in a pan held over a lamp, and the patient, seated on a chair, is covered over with tent made of sheets. At first the lamp should be turned low, to avoid undue irritation of the larynx by an excess of fumes. To be used ten minutes at a time, four to six times daily, and during the night in the sleeping-room. B. W. Switzer (Med. World, Apr., '96).

Acetic acid is frequently used as a stimulant. When inhaled its stimulating effects upon the nervous supply of the nasal mucous membrane causes it to sometimes act rapidly in restoring consciousness after fainting. In the same manner it may also arrest vomiting and headaches of nervous origin.

Vinegar as a remedy against vomiting in chloroform narcosis. Handkerchief moistened with vinegar applied to the nostrils and permitted to remain until patient returns to consciousness. Warholm (Univ. Med. Jour., Dec., '93).

As an escharotic it is often used on corns, warts, condylomata, and fungous growths. The glacial acetic acid should be used for this purpose.

Skin Diseases.—Acetic acid is useful in many disorders of the skin. In alopecia it has been used with advantage as a vesicant.

When alopecia is extensive the scalp should be shaved and acetic acid, in greater or less proportion, mixed with equal parts of chloroform and ether, applied. Or Besnier's formula may be employed:—

℞ Chloral hydratis, 75 grains.
Ætheris, 6 drachms.
Acid. acetic. cryst., 15 to 75 grains.

M. These applications are repeated two or three times a week at first and later at longer intervals.

Between-times a stimulating oil—as of eucalyptus and turpentine, of each, ½ ounce; crude petroleum and alcohol, of each, 1 ounce—is applied. This is to be followed by a thorough massage of the scalp for five minutes by the patient. Once a week, or oftener, the scalp is to be thoroughly shampooed with tincture of green soap. Morrow (Jour. of Cut. and Genito-Urin. Dis., Oct., '91).

In rodent ulcer and lupus vulgaris acetic acid is of use; but in the latter affection the benefit is only temporary.

In rodent ulcer. Cure of a young girl attacked with vitiligo of the body and alopecia of the scalp, in which the treatment consisted of two applications of acetic acid, together with stimulating lotions (tincture of rosemary, Van Swieten's solution, and tincture of cantharides). Feulard (Le Bull. Méd., Jan. 15, '93).

In eleven out of twelve cases ulcus rodens observed the ulcer was situated upon the lower lid. Treatment, by means of daily applications of a 75-per-cent. solution of acetic acid and subsequent rinsing with water, followed by good results. Wagner (Gräfe's Archiv f. Oph., B. 33, Ab. 3, '91).

Diseases of the Nose and Throat.—Acute coryza is sometimes arrested by the inhalation of acetic acid.

Glacial acetic acid is useful in preventing the development of hay fever by applications to the nasal mucous membrane twice per week. In practically all cases, however, the applications must be renewed each year. (Sajous.)

In hypertrophic rhinitis it may also be used in the same way; but chromic acid is more effective.

In tubercular laryngitis it has given good results in arresting ulceration. The ulcers are first scraped and the acid is then applied with a laryngeal applicator.

ACETONURIA.—Acetone (C_3H_6O = dimethylketone = $CH_3—CO—CH_3$) is a thin, watery, very movable, odorless liquid of neutral reaction. It has a curious aromatic odor, resembling somewhat that of acetic ether or of oil of peppermint. It is soluble in water, in alcohol and ether in all proportions; evaporates at ordinary temperatures; boils at 56.5° C.; and has a specific gravity of 0.81. Acetone can be obtained by the distillation of acetate of barium. Oxidation of acetone causes the formation of acetic acid and formic acid. As a product of metabolism, it was discovered by Petters, in 1857, in the urine of a diabetic patient.

Acetone is found in the urine of healthy individuals in quantities not exceeding 10 milligrammes per day, which, during starvation (Müller), can increase to 780 milligrammes per day. In some diseases it increases to 0.2 to 0.5 grammes daily. By distilling the urine examined, acetone can be obtained in a purer state, although still united with other volatile constituents of the urine.

Physiological and Pathological Excretion of Acetone.—Pathological acetonuria is observed (1) in fevers, (2) in diabetes, (3) in some forms of carcinoma which have not as yet induced inanition, (4) in psychoses, (5) in autointoxications, and (6) in different disorders of the digestion. Lorenz observed acetonuria and excretion of acetone with the fæces and the vomited matter in a case of peritonitis. In fevers acetonuria is constantly observed, and in the fevers of children as well (Baginsky). In cases of diabetes, acetonuria occurs when the disease has continued for a long time, and especially when the patients are put on an exclusive diet of proteids or proteids and fat, or when the allowance of food is not sufficient to maintain the equilibrium of metabolism.

In fevers, as well as in diabetes, acetonuria is often accompanied by excre-

tion of diacetic acid and beta-oxybutyric acid.

The Origin and Pathological Significance of Acetone, Diacetic Acid, and Beta-oxybutyric Acid.—The origin of acetone in the organism has not yet been ascertained. Cantani was of the opinion that it was formed in functional disorders of the digestive tract; Petters and Kaulich argued that it was due to fermentations in the bowels. Markownikoff ascribed it to a fermentative product of sugar.

> Acetonuria of intestinal origin cannot be denied, but its occurrence from this cause is probably much rarer than many have imagined. S. Boeri (Revista Clin. e Terapeutica, Nov., '91).
>
> The development of acetonuria from affections of the intestines of the most varied character is a phenomenon so constant that it would be well to add to the already recognized varieties of the condition a class caused by intestinal disturbances. In these cases of digestive fault it seems impossible to separate acetonuria and diaceturia, in that the differences in clinical manifestations between these substances are but slight, and really only quantitative in character, and the combination or alternation of the two conditions is almost always the case. The symptoms formerly attributed to these substances do not appear to be due to them, but to lower oxidized forms. When albuminuria exists it does not seem to be in any way dependent upon either of these substances. Acetone is to be found (sometimes in large amounts) in the contents of the stomach and intestine in many cases. There is a great difference between the primary and secondary gastro-intestinal affections, especially of nervous origin; in the former the gastric contents almost always contain acetone; in the latter it is rarely found. In several cases oxybutyric acid was also found in the urine. Lorenz (Oesterr.-ungar. Cent. f. d. med. Wissen., '91).

Albertoni did not find acetone in the urine of animals which had received large doses of glucose (100 grammes) or of different primary saturated alcohol; when isopropylalcohol was ingested it was excreted partly unaltered and partly changed to acetone, and when acetone was given to animals it was discharged by the urine, even if the dose of acetone ingested did not exceed 8 centigrammes.

When Gerhard detected the presence, in the urine, of a substance which gave a dark, wine-red color by means of a solution of perchloride of iron, he believed this substance to be diacetic ether, and was of the opinion that acetone was derived from this substance, which can easily be disintegrated into acetone, alcohol, and carbonic acid. Fleischer and Tollens proved this to be an error, and found that the coloring substance—at least, in the majority of cases—must be diacetic acid, which can be separated from the urine by the addition of sulphuric acid and extracted with ether. This opinion is supported by von Jaksch. Minowski caused acetonuria by extirpation of the pancreas, and von Mering by intoxication with phloridzin.

Lustig found that extirpation of the solar plexus in animals provoked acetonuria, glycosuria, and emaciation, while Oddi obtained the same results by sugar injections.

> The urine of animals from which the cœliac plexus has been removed shows the presence of acetone. Lustig and Oddi (Archives de Phys., Brown-Séquard, Oct., '92).
>
> The same reactions can be obtained in the urine of normal animals. Viola (Revista Gen. Italiana di Clin. Med., Pisa, '91).
>
> Acetonuria may not depend upon the extirpation of the cœliac plexus. It is to be noted that septic peritonitis is avoided with difficulty. Acetonuria observed for three days in a woman operated on for salpingitis. On the other hand, it was not met with in a dog which

had undergone, under all antiseptic precautions, subdiaphragmatic section of the vagus and extirpation of the ganglia. Contejean (Archives de Phys., Brown-Séquard, Oct., '92).

Lorenz is of the opinion that diacetic acid and the beta-oxybutyric acid are the substances from which acetone is derived, and that they are the real causes of the toxic symptoms observed in acetonuria, while acetone itself is relatively innocuous.

Von Engel found a great quantity of acetone in the urine of a patient suffering from lactonuria; when the milk was removed by a suckling apparatus the acetonuria disappeared. Very much acetone was found in the urine of patients suffering from severe chronic morphinism. In different acute fevers acetonuria is rather a constant symptom; in typhoid fever von Engel found it constantly; acetone was only missed when the typhoid fever was accompanied by obstipation.

Acetonuria occurs not infrequently in children, especially in febrile affections and in acute gastro-intestinal derangements. It may, however, be absent even in high and continuous pyrexia. Diaceturia, likewise, is frequent in children, and is almost constant in high and continued fever; and is common in the acute infectious processes, even if there be but little attendant fever,—as, too, is the case with acetonuria. Schrack (Fortschritte der Med., Oct. 1, '89).

Becker found that acetonuria increased after narcosis, the case being the same with an already existing acetonuria. This would seem to explain why acetonuria has been observed after great operations.

Operations are frequently followed by acetonuria, but, contrary to what has been claimed, this is not the result of opening the peritoneum or of the use of sublimate. It also causes no pathological reaction. Though traces of acetone may be met with in normal persons, this is not always the case, and it cannot, therefore, be regarded as a necessary product of metabolism. Conti (Wratsch, Dec. 7, '93).

In healthy subjects after narcosis acetonuria sets in, lasting from a few hours to several days. This postnarcotic acetonuria indicates an increased destruction of albumin. Ernst Becker (Virchow's Archiv f. Path. Anat. and Phys. u. f. klin. Med., Apr. 2, '95).

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Acetonuria follows anæsthesia in two-thirds of the cases, the anæsthetic used making no difference; if acetonuria is present before, anæsthesia increases it. The practical outcome is that, except in cases of urgency, anæsthetics should not be administered to diabetic patients. Abram (Jour. Path. and Bac., p. 3, 430, '96).

Marked and prolonged acetonuria detected during retrogression of fibroids after oöphorectomy or ligature of the ovarian arteries. Bossi (Arch. di Ostet. e Ginec., vol. iv, p. 4, '98).

Acetone, diacetic acid, and beta-oxybutyric acid are found in great quantities in the urine of diabetic coma, and different authors—Munser and Strassez, for instance—believe these substances to be the real cause of coma, perhaps by causing an excess of acidity in the organism.

In comatose patients who do not suffer from diabetes—as, for instance, in saturnine encephalopathies, etc.—diacetic acid is often found in the urine. Von Jaksch has proposed to give the name of "coma diaceticum" to these cases of coma. Nevertheless, neither acetone nor diacetic acid and oxybutyric acid have very prominent poisonous properties. Kussmaul gave animals 6 grammes of acetone per day without effect. Buhl, Tappeiner, and Frerichs came to similar results; Albertoni found

the lethal dose of acetone for dogs to be about 6 to 8 grammes per kilogramme of the dog's weight.

Case of cerebral apoplexy in which sugar and acetone were detected in the urine. The coma had come on suddenly, and was regarded as diabetic from the urinary condition; but the autopsy revealed an extensive cerebral hæmorrhage. Ruttan and Johnston (Montreal Med. Jour., Mar., '91).

Geelsuyden draws the conclusion from many experiments on rabbits that, even when small (10 to 20 milligrammes) subcutaneous injections of acetone are given, the acetone is excreted with the urine; in larger doses more acetone is excreted; but only a portion of the injected quantity reappears; another portion of it is excreted with the expired air; but still a portion is left which does not reappear and must therefore have been disintegrated in the body of the animal. After the injections albuminuria takes place. An adult rabbit can bear an injection of 2 grammes of acetone, but is killed by the injection of 6 grammes. In starving animals the experiments gave the same results; a portion of the injected acetone reappeared in the urine and the expired air, while still another portion was disintegrated in the body. Geelsuyden draws from these experiments the conclusion that the acetonuria observed in starving individuals is not caused by a diminution of the power to disintegrate acetone already formed in the body, but to an increase of the amount of acetone formed in the body.

Modern authors generally admit that acetone is a product of the metabolism of proteids. Hönigmann and von Noorden are of the opinion that acetone is only formed by diminution of the organized albumin of the body, and never by the metabolism of the proteids ingested with the food, be the quantity ever so large. Hönigmann supported this theory principally by experiments made on himself, which proved that when he lived exclusively on large quantities of proteids—that is, when nutrition was insufficient—acetone and diacetic acid were found. The acetonuria was not augmented when more albumin was ingested, but disappeared when he took plenty of carbohydrates in addition to the proteids. Von Engel, on the contrary, is of the opinion that in all cases when great quantities of albumin are decomposed in the body the quantity of acetone excreted with the urine will increase considerably,—equally if the albumin is ingested with the food or taken from the stock of the body.

Relations existing between pathological acetonuria and azoturia in several diseases (diabetes mellitus, typhoid fever, pneumonia, phosphorus poisoning): acetone seems to increase, especially in those cases where destruction of albuminoid matters is also increased, whether they be of organic nature or belong to the albumin of alimentation. A direct proportion between the amounts of acetone and albumin has not been observed. A solution between the two is sometimes observed, but it is by no means constant. Palma (Jour. de Méd. de Chir. et de Pharm. Bruxelles, Feb. 2, '95).

Literature of '96-'97-'98.

Ten cases of more or less pronounced acetonuria in pregnant and parturient women whose gestation subsequently ended in the birth of a dead child. In half the cases the women were syphilitic, but, if the fœtus survived, the mother's urine contained no acetone; hence acetonuria in a pregnant woman is a sure sign of the death of the fœtus. This sustains the views of Vicarelli. Knapp (Cent. f. Gyn., No. 16, '97).

Weintraud and Hirschfeld are decided opponents of this theory. Weintraud argues that—in a case of severe diabetes

where complete equilibrium of the metabolism, and especially of the metabolism of nitrogen, was maintained for a long time, so that no albumin contained in the tissues was consumed—acetone, diacetic acid, and beta-oxybutyric acid were constantly excreted with the urine; the diet was free from carbohydrates; when, also, the quantity of proteids was somewhat reduced the sugar disappeared after twenty-four hours; the weight of the body was maintained, but still acetone and diacetic acid continued to be excreted.

Carbonate of soda augmented the quantity of acetone excreted, without diminishing the quantity of oxybutyric acids. When, in periods of twenty-four hours, no food at all was taken, acetonuria was greatly increased. Ingestion of carbohydrates diminished the acetonuria even in persons suffering from diabetes; levulose, milk, and sugar have the same property; glycerin, also, as observed by Hirschfeld. The addition of fat to the food has no power to arrest the acetonuria.

Hirschfeld found that when he put two individuals on light diet, consisting only of proteids and fat, diminution of albumin of the body, as well as acetonuria, was produced. When carbohydrates were added to the food the acetonuria diminished, and that to a much greater degree than the diminution of albumin. Ingestions of fat had absolutely no influence in diminishing acetonuria, although it diminished the loss of nitrogen. Acetonuria is more marked when the albuminous food is scarce than when it is given in great quantities. The ingestion of carbohydrates has an extraordinarily rapid effect on the production of acetonuria, the quantity of acetone being considerable within two hours. Experiments in persons who were almost starving have proven that a moderate quantity of carbohydrates was sufficient to bring about a considerable diminution of acetonuria in spite of the considerable loss of albumin and fat which still took place.

Literature of '96-'97-'98.

Objections to the view that pathological acetonuria is due to autointoxication. It was formerly thought that, apart from diabetes, acetonuria might occur in the fasting state, in fever, and in special diseases, such as carcinoma. The increased production of acetone was looked upon as the result of increased albuminous decomposition. This rests on a false basis. It was known that acetone was present in the urine in people fed exclusively on albuminous foodstuffs and fat, and that the increase disappeared when carbohydrates were taken. The author showed that even small quantities of carbohydrates had a very considerable effect on the acetone excretion; that the acetonuria found in febrile affections and in carcinoma could be made to disappear when abundant carbohydrate foodstuffs were given, and that it increased when the patient could eat less. The question of acetonuria in diabetes is in accord with the view of its connection with carbohydrate metabolism. There is very little difference between the healthy and diabetics, as long as the latter can deal with the largest part of the carbohydrate foodstuffs supplied, but when the carbohydrates are excreted as sugar the acetone in the urine is increased. The difference between the healthy and diabetics is that in the latter, notwithstanding abundant carbohydrate foodstuffs, acetone excretion is abundant, and that, whereas in the healthy the acetone in the urine does not exceed 0.9 gramme, in the diabetic it is much above 1 gramme. It is only correct to speak of a pathological acetonuria in diabetes. Hirschfeld (Cent. f. inn. Med., June 13, '96).

Geelsuyden, from his experiments on rabbits and dogs already mentioned,

reached the conclusion that acetone is formed in the tissues, not in the kidneys; that the kidneys give passage to the acetone even when their blood contains a very small quantity of it; and that pathological acetonuria is not caused by a defect of disintegration of acetone in the body, but by a disorder of the general metabolism leading to the formation of an anomalous large quantity of acetone. Geelsuyden has further conducted a series of experiments in healthy individuals (medical students) put on different scales of diet, which were strictly controlled. As all observers did, Geelsuyden found that when a person was put on exclusive flesh diet acetonuria appeared, and at the same time the body lost albumin as well as fat; when large quantities of proteids were ingested, acetonuria was less considerable than when less albumin was given. Complete starvation, an exclusive fat diet, and a diet of proteids, with the addition of a great quantity of fat, cause a very considerable amount of acetone to be excreted. As exclusive diet of fat and complete starvation give rise to the excretion of the largest quantity of acetone, it seems that acetone is formed by disintegration of fat, and that in this respect there is no difference between the fat of the food and that of the tissues. Carbohydrates have a great power to check the excretions of acetone; when individuals were put on a diet without carbohydrates and secreted urine containing a great quantity of acetone, the acetonuria disappeared in a few hours when carbohydrates were given. From 150 to 200 grammes of carbohydrates per day are required to check an already existing alimentary acetonuria.

In the opinion of Geelsuyden, acetonuria occurs when carbohydrates are not ingested in sufficient amount, and acetone is formed by the disintegration of fat, either of that of the tissues or of that contained in the food.

Preliminary Tests for Acetone.—With an alkaline solution of sodium nitrocyanide (of a slightly-red hue) acetone gives a ruby-red color, changing, after some time, to yellow, and after acidifying with acetic acid and boiling, to greenish-violet.

The cyanide-of-soda test, after Legal or le Nobel (see below), may be employed as preliminary test; but, to make the presence of acetone positive, it is necessary to separate it from the urine by distillation. As the boiling-point of acetone is low (56° C.), this may be done at a low temperature, and the use of a water-bath is recommended.

Legal's Test.—To ten cubic centimetres of urine a small crystal of nitrocyanide of soda or some drops of a freshly-made solution of this reagent are added; the fluid is rendered strongly alkaline by a 30-per-cent. solution of caustic soda or potash. When acetone is present a beautiful-red color will appear, which will change only after some time to yellow; the red color produced in the same manner by creatinine becomes yellow sooner. Legal adds that, when acetone is present and the urine, shortly after the addition of the solution of soda, is neutralized with acetic acid, the urine assumes a purple-red color, and, when diluted with water, a crimson hue. When the acetic acid is floated on the urine a crimson ring will appear at the point of contact, and, when much acetone is present, the color of the ring will be purplish-red.

Le Nobel's Test.—Le Nobel and Fehr hold that Legal's test is only reliable when much acetone is present; and that, when there is only a small

quantity of it in the urine, the test may be fallacious, since other substances contained in the urine can produce a red color with the nitrocyanide of soda. The most characteristic point of the test is, according to Fehr, the appearance of the violet hue, which causes the red color to become crimson or purple and not pure red.

Le Nobel proposes to substitute a solution of ammonia for the solution of soda, when the test is, in other respect , made according to the indications of Legal, the fluid containing acetone is not immediately colored, but after some time, when the liquid is shaken with air or some drops of a strong acid added (the alkaline reaction being maintained), the fluid takes a rose-red color, increasing gradually and changing after some time to violet wine-red. By heating the fluid the color disappears, but returns on cooling down; when boiled with acids it changes into greenish-violet. Le Nobel's test is more delicate than Legal's, and will reveal 0.00025 gramme of acetone.

Fehr's Test.—Fehr also employs the test after the method of Legal, but proposes, when the color of the urine after the addition of solution of soda is passing from dark-red to yellow, to float some drops of acetic acid on the urine. When the test-tube is slightly rotated so that only a small quantity of the acid mingles with the urine, a beautiful violet color will appear when acetone is present, the intensity of the color being proportionate to the quantity of acetone contained in the urine.

Chautard's Test.—Romine recommends, as a reliable test for acetone in the urine, a solution of fuchsin (1 to 2000) into which a current of sulphurous-acid gas has been passed. This rapidly decolorizes the liquid and causes it to assume a clear-yellow tint, which is permanent and unaffected by an excess of acid. A few drops of such a solution, added to a urine containing acetone, produce a deep-violet color. The test is delicate enough to allow the detection of one part of acetone in one thousand of urine.

Definite Tests for Acetone.—When no very great quantity of acetone is found in the urine it is absolutely necessary to distill the urine and to test the distillate with the different reagents. The distillation of two hundred to three hundred cubic centimetres of urine is made in a water-bath, and a temperature of 56° to 58° C. is employed. No acid need be added to the urine before distillation, as the acetone becomes distilled very well without acid and the acid might disintegrate other substances present and thus cause the formation of acetone. There is no reason why special care should be taken lest a small amount of ammonia be distilled with the acetone. The distillation is only continued until a sufficient quantity of fluid for the different tests to be employed has passed over into the recipient. The distillation is then subjected to the following tests:—

Lieben's Iodoform Test.—To a few cubic centimetres of the distillate a few drops of a solution of potassium and some drops of a solution of iodine and iodide of potassium are added, the solution of potassium being added in excess. When acetone is present, a thick, yellow precipitate of iodoform will immediately form. This test will reveal 0.01 milligramme. By heating, the iodoform evaporates and accumulates on the sides of the test-tube in the form of small yellow plaques, consisting of the characteristic crystals of iodoform. The most serious objection to Lieben's test is that many (at least seventeen) other sub-

stances, and especially alcohol, may give the same result.

> Lieben's iodoform test recommended both for delicacy and ease of application. A yellow opacity, with precipitation of iodoform, occurs if acetone be present. Nothing else that occurs in the urine, except acetone, is able to give this precipitate of iodoform, without warming. When but small quantities are present the urine should first be made acid with sulphuric acid and distilled. When half the urine has been distilled all the acetone has been found to be in the distillate. Ruttan (Montreal Med. Jour., Mar., '91).

Gunning's Test.—Gunning modified Lieben's test by using a solution of ammonia and tincture of iodine. Le Nobel prefers to use a solution of ammonia and iodine dissolved in iodide of ammonium; this certainly is the best way to make the iodoform test, as no alcohol is added with the reagents. According to le Nobel, 0.001 milligramme of acetone can be detected by this test, but von Jaksch could only detect acetone by it when present in a quantity of 0.1 milligramme. Errors caused by the presence of alcohol are avoided by this test.

Reynold's Test. — Freshly-precipitated oxide of mercury is dissolved by acetone in the presence of alkali. Le Nobel prefers to make the test by precipitating a solution of perchloride of mercury with an alcoholic solution of caustic potash, added until the mixture gives a strong alkaline reaction; then the fluid containing acetone is added and the whole well shaken in a test-tube. The fluid is then filtered and care taken that the filtrate be perfectly limpid. The combination of acetone and oxide of mercury in the filtrate can be detected by chlorate of stannum or by floating some drops of the filtrate on a solution of sulphide of ammonium: where the two liquids touch each other a black ring will appear. By means of this test 0.01 milligramme of acetone is revealed, and the test is at once very delicate and very reliable.

The Nitrocyanide Test.—This test is made with the distillate quite in the same manner as with the urine either after the method of Legal or after le Nobel's modification of it. This test is less delicate, and the phenols, which possibly might have passed over into the distillate, are apt to give the same color as the acetone; the test, therefore, gives no proof of the presence of the latter substance.

Penzoldt's Indigo Test. —Baeyer and Drewsen found that acetone forms indigo blue with orthonitrobenzaldehyde. Penzoldt has employed this reagent by dissolving urine crystals of orthonitrobenzaldehyde in boiling water; on cooling down the aldehyde forms a white, milky cloud; the fluid which is to be tested is now added and the mixture rendered alkaline with a solution of potash. When acetone is present a yellow color will appear, which changes to green and, after ten minutes, to indigo; it also forms an indigo-blue precipitate. Very small quantities of acetone may be detected by shaking the mixture with a few drops of chloroform. When left quiet for some time the chloroform takes a blue color and sinks to the bottom of the test-tube.

According to Penzoldt, acetone is revealed by this test in a solution of 1 to 2000. According to von Jaksch, the smallest quantity of acetone revealed by it is 1.6 milligrammes. Aldehyde acetophenone and other substances form indigo in the same way as acetone, but the color is not so marked.

Malerba's Test. — Malerba found that a ½-per-cent. solution of paramidodimethylaniline with acetone gives a

reddish color, changing into violet and blue-red.

> The violet color changes to rose and the next day to red. Under the spectroscope two stripes are seen analogous to those of hæmoglobin. The test is also good for uric acid, the solution of the latter being left to evaporate, and when the residue is fairly dried some drops of the above solution added, when a blue coloration is obtained. Malerba (Revue des Sci. Méd. en France et à l'Etranger, Apr. 25, '95).

Miscellaneous Tests.—With bisulphite of soda, acetone, as well as the aldehydes, combines to a crystallic compound in thin flakes resembling much those of cholesterin, even by microscopical examination. (Limpricht.)

Acetone in an alkaline solution combines with iodine to form iodoform.

Freshly precipitated oxide of mercury is dissolved by acetone. Indigo is formed when acetone is combined with orthonitrobenzaldehyde in an alkaline solution. (Baeyer and Drewsen.)

> Bichloride of mercury recommended as a reagent for acetone and albumin, as well as for the estimation of the quantity of glucose and nitrogen present in the urine. Pittarelli (Gl' Incurabili Gior. di Clin. e di Terapia, Nos. 16 and 17, '94).

> Certain substances (sugars) yield the reactions usually characterizing acetone. This is due to decomposition of sugar and formation of acetaldehyde. In testing by the ordinary method, the urine should, therefore, be moderately acidified and distilled slowly and not too long. Salkowski (Jour. de Méd., de Chir., et de Pharm., Bruxelles, Jan. 26, '95).

From what has just been stated it will become apparent that none of the tests are specific for acetone alone. To be quite sure that acetone is contained in the distillate, it is, therefore, necessary to try successively by all the tests, and only when all tests give positive result is the presence of acetone proved.

Von Jaksch has tried to employ the nitrocyanide test for a quantitative estimation of the acetone, and the iodoform test has been recommended by Messinger and Huppert for the same purpose. The quantity of iodine used to form iodoform with the acetone is measured, and the quantity of the acetone present in the solution calculated by it also; but, although Engel and Devoto are of the opinion that it is possible to make pretty accurate estimations in this way, methods for quantitative estimation of the acetone are not to be relied upon, as it is impossible to avoid errors caused by the presence of substances which are influenced by the tests in the same way as the acetone.

Diacetic acid ($C_4H_6O_3 = CH_3—CO—CH_2—COOH$) may be revealed in the urine by the aid of a solution of perchloride of iron, which, with diacetic acid, produces a dark, wine-red color. The test is made by adding a solution of perchloride of iron as long as a precipitate of phosphates of iron is formed. The mixture is then filtered and some drops of perchloride are added to the filtrate. When diacetic acid is present, the filtrate takes a deep-red color, which vanishes in twenty-four hours, and more rapidly after addition of strong acids. Von Jaksch has, by a colorimetric method based on this test, tried to make an approximate estimation of the quantity of diacetic acid contained in the urine, but newly-passed urine can alone be used for the search of diacetic acid, as this acid, after some time—twenty-four to forty-eight hours—will disappear from the urine. Diacetic acid can be isolated from the urine by adding a few drops of sulphuric acid and shaking the mixture with ether. When diacetic acid

is present, it is dissolved in the ether and can be detected by the perchloride-of-iron test.

Beta-oxybutyric acid ($C_4H_8O_3$) is also found sometimes in the urine of fever patients, as well as in diabetes, with acetone and diacetic acid. This may also be the case in the dyspepsia of alcoholism and in carcinoma of the stomach. When beta-oxybutyric acid is cautiously oxidated, acetone is found.

F. Levison,
Copenhagen.

ACETO-ORTHO-TOLUIDE. — Aceto-ortho-toluide is an isomer of exalgin, and appears in the form of colorless needles, freely soluble in alcohol, ether, and hot water, but little soluble in cold water. Its melting-point is 224.6° F. and boiling-point 564.8° F., being comparable in these respects to acetanilid and methylacetanilid, which it resembles chemically, being also, like these drugs, an active antipyretic.

Physiological Action. — Aceto-ortho-toluide acts chiefly on the cord, and only in toxic doses on the brain and medulla. The heart is last affected. Doses of $^3/_5$ grain per kilogramme of the body-weight reduce normal temperature by about $1\frac{1}{2}$° F., and bring febrile temperatures to the normal point. It does not alter the blood-pressure, but somewhat increases the frequency of the heart-beats, though leaving the vasomotor centres unaffected. It causes dilatation of the blood-vessels by direct stimulation of the nervous elements of the vascular walls themselves. The fall of temperature is, moreover, due to the loss of heat consequent on this dilatation. (Barabini.)

Therapeutics.—Although this product was introduced as one superior to acetanilid, owing to its being less toxic, it does not seem to have received much support from the profession. It was also credited with antiseptic properties even in a weak solution (5 to 1000).

ACETPHENETIDIN. See Phenacetin.

ACETYLENE.—When calcium carbide (CaC_2) is brought in contact with water, acetylene-gas is formed. Being capable, when lighted, of furnishing a degree of light far superior to that of ordinary gas, acetylene has recently been considerably used as an illuminant. When prepared from pure calcium carbide and purified by liquefaction, it has a pleasant ethereal odor and can be breathed in small quantities without giving rise to ill effects. Impure gas, prepared from coal or impure lime, may contain calcium sulphide and phosphide, and the acetylene prepared from it may then have a very unpleasant odor.

Acetylene Poisoning.—Acetylene may be fatally poisonous when present in proportions as high as 40 per cent. by volume, as recently shown by Gréhant. Berthelot, and Moissant. A mixture of 20 volumes of acetylene—prepared from calcium carbide, 20.8 volumes of oxygen, and 59.2 volumes of nitrogen—was breathed by a dog for thirty-five minutes without any marked disturbance, and 100 cubic centimetres of the blood was found to contain 10 cubic centimetres of acetylene. With 40 volumes of acetylene, the proportion of oxygen remaining the same, a dog died in less than an hour, owing to failure of the heart's action, and 100 cubic centimetres of blood contained 20 cubic centimetres of acetylene. With 79 volumes of acetylene and 21 volumes of oxygen the poisonous effects were still more strongly marked.

The poisonous action of acetylene

itself is feeble when the blood is at the same time supplied from the air with the usual amount of oxygen. In other words, acetylene inhaled in the open air is but slightly harmful.

Literature of '96-'97-'98.

One hundred volumes of blood dissolve about eighty volumes of acetylene; the solution shows no characteristic spectrum, and is reduced by ammonium sulphide as readily as ordinary arterial blood. In a vacuum part of the acetylene is evolved at the ordinary temperature and part at 60° F. If the blood is allowed to putrefy, the volume of acetylene given off at the ordinary temperature remains practically the same, but the quantity liberated at 60° decreases as putrefaction advances. If any compound of acetylene and hæmoglobin is formed, it is very unstable, and is not analogous to carboxyhæmoglobin. Brociner (Boston Med. and Surg. Jour., July 30, '96).

In a closed room, however, where the oxygen is not kept up to the normal standard, when the accumulation of a foreign gas would prevent the constant renewal of air through window and door interstices or open chimneys, and where the products of respiration would be allowed to accumulate, it would quickly prove mortal by paralyzing the respiratory function.

Literature of '96-'97-'98.

Experiments on dogs, guinea-pigs, and other animals showing that acetylene has considerable toxic power. One pint of the pure gas caused severe symptoms of poisoning in dogs, and even when mixed with air (20 per cent.) it proved fatal after an hour. If the gas was administered rapidly, the animals recovered when placed in the open air, but if given slowly this did not occur, and the animals died. Mosso and Ottolenghi (Rif. Med., Jan. 23, '97).

A mixture of air and acetylene commences to be explosive when it contains 5 per cent. of acetylene, whereas it requires the presence of 8 per cent. of coal-gas to make a similar mixture explosible. If a rabbit is placed in a bell-jar into which ordinary air and acetylene are pumped, the animal seems for a long period to experience very little inconvenience. It is not until ordinary atmospheric air is excluded and only acetylene admitted that symptoms gradually and slowly develop. After a more lengthened exposure to acetylene than that which is necessary for coal-gas the animal becomes intoxicated, it falls over on its side apparently profoundly asleep, and, while all through the experiment its breathing has been somewhat short and rapid, stupor steals over the animal apparently painlessly. A few inhalations of atmospheric air are sufficient to restore to the animal all its faculties. Should inhalation have been pushed further and the animal have been very deeply asphyxiated, death may ensue, cyanosis, hitherto observed, being rapidly replaced by extreme pallor. In minor and easily-recoverable stages of asphyxia the vascular tension is still maintained, and there is no difficulty in obtaining a drop of blood for examination; but when the deeper stages are reached so extremely contracted are all vessels that it is almost impossible to obtain even a trace of blood. When this stage has been reached recovery is difficult. When blood of a rabbit was examined at different stages of intoxication from acetylene, and especially in deepest asphyxia, this fluid on spectroscopic examination always exhibited two well-marked bands of oxyhæmoglobin; also that, unlike the blood in coal-gas poisoning, although resembling it in the cherry-red color which it presented, it was readily reduced on the application of ammonium sulphide and gentle heat. Thomas Oliver (Brit. Med. Jour., Apr. 23, '98).

Treatment of Acetylene Poisoning.— That fresh air should at once be given the patient need hardly be mentioned. The patient should be removed from the poisoned atmosphere into a well-ventilated room and artificial respiration

practiced. Hypodermic injections of strychnia and digitalis should be administered, while oxygen is sent for. This gas should be inhaled as soon as practicable, while artificial respiration is continued with vigor, the patient being simultaneously rubbed. Rectal injections of warm coffee are also useful.

In all such cases the efforts of the physician should be kept up a long time, the respiration and pulse being unreliable guides as regards the presence in the system of sufficient life to render resuscitation possible.

Therapeutics. — Acetylene has not been used in therapeutics.

ACETYLMETHYL. See ACETONURIA.

ACIDS. Classified under their individual names, as ACETIC, TANNIC, etc.

ACNE.

Definition.—Acne is characterized by the presence, on the face, of small elevations or nodosities varying in size from a pin-head to a pea. These elevations, or pimples, are also present on the back, shoulders, and chest in many cases.

Symptoms.—The elevations are conical or hemispherical, and, as a rule, in the earliest stage of the lesion somewhat painful, especially upon pressure. In most of the lesions there is a distinct tendency to suppurative change. In the centre of the lesion a whitish-yellow spot forms where the pus raises the epidermis. In from three to ten days, or even longer, the lesion breaks and a small amount of pus is discharged. At other times the pus dries to a thin crust, or occasionally the contents, especially in sluggish lesions, are absorbed. A red elevation is left which gradually flattens out, leaving a brownish stain, which eventually disappears. The surrounding skin is frequently oily and shiny. Tumors as large as a pea or a small nut, formed by retention-cysts of sebaceous glands, are sometimes seen; they may gradually work to the surface or may persist for months and finally disappear or form hard spherical indurations by retraction and inspissation of their contents. Scarring, usually consisting of small, white, cicatricial depressions, is to be seen as a consequence in some cases. In the majority of cases, however, permanent marks are not left. The regions most affected in acne are the face, shoulders, and anterior and posterior aspects of the shoulders. Occasional cases are observed in which the back, extending as far down as the sacrum, is the chief seat of the disease. In rare instances (acne cachecticorum, acne scrofulosorum, and acne medicamentosa) the eruption may be more or less general.

Varieties.—There are several varieties of lesion observed in acne, one kind of which is apt to predominate, and this has given rise to the so-called varieties of the disease.

Acne vulgaris, or acne simplex, is, by far, the most common clinical type. The lesions are usually of a mixed character, consisting of black-heads, pin-head to pea- sized papules, papulo-pustules, and pustules. Each lesion may in its beginning have a small, red areola. There is also slight pain upon pressure. The lesions are rapid in evolution, running a course in several days to a week. As in all types, they are discrete and isolated.

The term "acne papulosa" is given to a not uncommon type in which the lesions are usually small and show but little disposition to reach the pustular stage, disappearing by absorption or by desiccation and exfoliation.

Acne punctata might be termed minute papular, the lesions being, for

the most, pin-head in size, with a central comedo, or black-head.

Acne pustulosa is another type in which the lesions go rapidly into the pustular stage, the eruption appearing, for the most part, to be made up, almost entirely, of pustules. In size they vary from a large pin-head to a large-sized pea. "Acne indurata," or "tuberculosa," is a form of the eruption in which the lesions tend to be closely crowded here and there and in such places, and also with single lesions, the underlying base becomes hard, inflamed, and indurated, being also somewhat deep-seated.

In acne phlegmonosa the inflammatory and suppurative process begins deep down in the sebaceous gland, forming veritable small dermic and intradermic abscesses, usually with but slight tendency to break through the surface.

Acne cachecticorum characterizes an acneic eruption, more or less general, occurring in weak, cachectic individuals: the lesions are livid, indolent, violet-red papulo-pustules of moderate and large size and of slow evolution, leaving, as a rule, small cicatrices. Acne scrofulosorum is really a variety of the last named, — acne cachecticorum, — occurring in those of distinctly strumous or tuberculous temperament.

> Severe case of acne scrofulosorum in girl with no tubercular family history, but with enlarged cervical glands. Acneic pustules and comedones extremely numerous, developed in crops, suppurated freely, left deep livid-blue scars, most noticeable over buttocks and thighs. J. J. Pringle (Brit. Jour. of Derm., Apr., '95).

> Five cases of acne scrofulosorum in infants. Clinical features: an indolent, small papulo-pustular or acneiform eruption, occurring in infants, sparsely disseminated and not grouped, unaccompanied by subjective symptoms. It affects chiefly the extremities, the lower in particular, and their extensor surfaces. The buttocks and regions above are often involved. The lesions appear successively or by subacute outbreaks. The papules develop about the hair-follicles and become successively pustular and crusted. When the crust with a central plug is lost, a flattened, crateriform, irregular lesion, like those of lichen planus, is left. After complete involution, a stain or faint scar remains. T. Colcott Fox (Brit. Jour. of Derm., vol. vii, No. 11, p. 341, '95).

Acne artificialis seu medicamentosa is a form of acneic eruption produced by the ingestion of certain drugs, as the iodides and bromides, and also by the external applications of certain remedies, such as tar, the paraffin-oils, etc.

> An artificial type of acne may be seen on the chest, abdomen, and back, the cheeks, forehead, and chin being affected in those who are taking iodide, while the chin is covered when the cause is either menstrual or intestinal. That associated with rosacea begins around the nose. In the cachectic type or in those who are hard students or of a nervous temperament it is more frequently witnessed on the forehead. Those who present lesions upon the entire face are generally found to suffer from habitual constipation. The treatment should be based upon these facts. Dyer (New Orleans Med. and Surg. Jour., June, '94).

"Acne atrophica" is a name given to those cases of acneic eruption which tend to leave depressed scars. This probably occurs most frequently in those cases in which the lesions are sluggishly papular or papulo-pustular, the lesions disappearing by absorption or crusting and leaving behind small punched-out cicatrices.

Acne hypertrophica is really the opposite of the last-named variety, and occurring in about the same kind of cases, small, whitish, connective-tissue pin-

point or small-pea sized projecting hypertrophies marking the sites of the lesions. It is rare.

Etiology.—Acne begins usually near puberty, when the pilar system is more actively developing, and the functions of the sebaceous glands likewise; and is more frequent among patients with digestive troubles, constipation, dilatation of the stomach, menstrual irregularities, the strumous diathesis, possibly the arthritic diathesis, and disturbances of the nervous system.

> Anæmia, dyspepsia, constipation, amenorrhœa, and dysmenorrhœa are all exceedingly common functional derangements or disorders occurring simultaneously with acne, but no more a cause of it than of psoriasis and scabies. Stephen Mackenzie (Brit. Jour. of Derm., Oct., '94).
>
> Constipation is a most important factor. That nerve-influence considerably affects acne may be witnessed during menstruation and dyspepsia. Stopford Taylor (Brit. Med. Jour., Oct., '94).

It has been also alleged that lesions of the genito-urinary organs and venereal excesses may provoke the disease. Lesions may be due to mechanical irritation caused by the product of secretion remaining in the excretory canal or gland itself. Some drugs, as already stated, — such as the bromides and iodides,—are occasionally responsible for the eruption or an increase in an already-existing eruption. Certain drugs applied externally may also provoke acneic lesions, such as tar and tar products, juniper-oil, and the like. Workers in paraffin and paraffin products will not infrequently be found affected with papules and pustules, especially those of a furuncular or abscess type.

> Professional form peculiar to workers in paraffin; eruption papular, furunculous, or acneiform; affects hairy portions of the skin. Gervais (Thèse de Paris, '95).
>
> [As in artificial eruptions, individual predisposition here naturally plays a most important rôle. L. Brocq, Assoc. Ed., Annual, '96.]

Pathology.—In most cases the process begins by a perifolliculitis, which later on gives rise to a purulent folliculitis. It would thus seem that the sebaceous glands play but a small part in the affection. In some cases, however, when comedones are present, the sebaceous gland itself is the starting-point of the inflammatory process. (Brocq.)

Even when the focus of irritation is in the follicle, it is frequently limited to the sebaceous or sebaceous pilary canal. (E. Besnier, A. Doyon.)

The papillæ surrounding the comedone and the superficial layers of the corium are filled with blood-vessels full to repletion, and of exudation cells which are found in dilated vacuoles. (Kaposi.)

If the process is very intense, the sebaceous gland may be entirely destroyed by the local inflammatory action, while the pilar bulba persists. (Kaposi.)

The acneic process may be divided into two parts: 1. Closure of the sebaceous follicle and formation of comedo. 2. Suppuration, which only occurs in those follicles where the staphylococci aureus et albus have penetrated before the comedo formed. (Unna.)

> In true acne the bacillus described by Unna is invariably present. It always occupies the same portion of the comedo,—namely, the bottom of the central cavity, only reaching the uppermost part in markedly-developed comedones. Menahem Hodara (Jour. des Mal. Cut. et Syph., Sept., '94).
>
> Acne is a local disease whose anatomical element is the sebaceous gland, the physiological element being the oversecretion of fat, while probably there is a third bacteriological element. Mal-

colm Morris (Brit. Jour. of Derm., Oct., '94).

Acne is due to an epithelial secretion of fat beyond what could be consumed by the integument; a deposit of unusual fat collected in the ducts of the glands, giving rise to microbic changes. Leslie Roberts (Brit. Jour. of Derm., Oct., '94).

Literature of '96-'97-'98.

Bacteriological examination of comedones and pustules: The staphylococcus pyogenes albus is constantly present in the pustules of acne; there are also present occasionally a yeast-fungus and a bacillus, but always in small numbers. In the non-inflamed comedo there is an abundant development of microbes, the staphylococcus albus always being present. At the moment that inflammation occurs in the comedo a considerable diminution in the number of kinds of microbes occurs.

The skin of those not affected by acne is just as rich in microbic species as that of the acneic patient.

The presence of certain microbes is not sufficient to explain the occurrence of the malady. One cannot accept the theory of a specific cause in acne.

Unna's special bacillus is only a small virulent variety of the bacterium coli. Lomry (Derm. Zeit., B. 3, H. 4, '96).

In all cases a high specific gravity of the urine and an increase of the crystalline sediments noted. The increase of the salts in the blood causes an irritation in the sebaceous glands or in their vessels. Bardach (Derm. Zeit., vol. ii, No. 2, '96).

Diagnosis.—Acne is to be differentiated from the papular, papulo-pustular, and pustular syphiloderms, and also from variola.

Syphilis.—In the syphilitic eruption the distribution is more or less general, and more acute in its outbreak, darker hued, and occurring occasionally with special groupings and the presence of other symptoms of the disease.

Variola.—In small-pox the premonitory constitutional symptoms, the sudden outbreak, the uniformity of the lesions, and many other symptoms of differential character will serve to differentiate.

Treatment.—In this connection acne may be divided into (1) an *irritable* or inflammatory variety, in which the skin is fine and thin and easily irritated by stimulating applications, and where general treatment is important on account of the close union between the acneic eruption and various constitutional disturbances. Local treatment should, at first at least, be of a mild character. (2) An *indolent* variety, where the integument is thick, rough, and oily, with enlarged and obstructed gland-orifices, and where the most energetic local applications are well borne; here the local treatment is important. Probably most of the cases met with occupy a middle ground between these two extreme varieties.

General Treatment.—Prophylactic measures, such as the avoidance of external irritants, drugs and food liable to cause acne, such as coffee, tea, alcohol, pure wine, pork, veal, game too far gone, preserved fish, shell-fish, fats, and cheeses.

Literature of '96-'97-'98.

Increase in the solids of the blood causes an irritation of the sebaceous glands. Rapid cure is effected in these cases by increasing diuresis and local applications of a soap containing about 1½ per cent. of iodate and bromate of sodium. Bardach (Derm. Zeit., vol. ii, No. 2, '96).

Any disorder of digestion must be counteracted in order to avoid the congestion of the face following meals.

Attention to the condition of the alimentary canal and other disorders, as well as well-directed local treatment, is a quicker and more efficacious method than local treatment only. Radcliffe Crocker (Brit. Jour. of Derm., Oct., '94).

If the tongue is much coated and shows prominent papillæ, the following is recommended:—

℞ Sodium bicarb., 10 grains.
Ext. of cascara sagr. liq., 10 to 20 minims.
Tinct. of nux vomica, 7 to 10 minims.
Peppermint-water, enough to make 1 fluidounce.—M.

After this has been taken for a week or ten days, if there is any indication for iron, a pill of reduced iron of 2 or 3 grains may be given after dinner or oftener.

Literature of '96-'97-'98.

Dyspepsia—which occurs frequently in patients suffering from acne—is almost always accompanied by dilatation of the stomach and gastric fermentation, and the amount of hydrochloric acid in the gastric juice varies. Violent pyrosis and constipation occur frequently in patients suffering from acne. The treatment of the dyspepsia improves the acne. Weak doses of ammonium fluoride—¾ grain after each meal—are recommended. This drug quickly arrests fermentation without disturbing the digestion. Mitow (Thèse de Paris, '96).

Constipation should be counteracted by gentle aperients. Any condition capable of maintaining the sympathetic system in a state of tension—such as genito-urinary troubles or affections of the nasal fossæ—should be eradicated if possible.

If the patient is lymphatic and has a good digestion, codliver-oil is of value.

Literature of '96-'97-'98.

Much benefit obtained from syrup of lactophosphate of calcium in acne, especially when lumps are large. A favorable and palatable mixture when codliver-oil is required is the following:—

℞ Gum arabic, 10 drachms.
Water, 1 ounce.
Syrup of lactophosphate of calcium, 3 ounces.
Codliver-oil, 4 ounces.
Essential oil of bitter almonds, 3 minims.

The gum, water, and syrup should be rubbed together until a smooth mucilage is made, then the codliver-oil is to be added gradually, with constant stirring, and lastly the essential oil of bitter almonds. Made in this way, each tablespoonful of mixture contains 4 grains of lactophosphate of calcium and 50 per cent. of codliver-oil. H. S. Purdon (Dublin Jour. of Med. Sci., Feb., '98).

Anæmia or chlorosis call for the use of chalybeates with arsenic. Iron often does harm unless its constipating effect is counteracted by using aperients. When the patient is arthritic, alkalies, especially alkaline waters, are indicated.

No really specific treatment is known against acne, but the following have been recommended:—

Sulphur alone: powder or tablets, or with equal parts of honey.

Ichthyol (Unna):—

℞ Ichthyol, 1 to 2 drachms.
Dist. water, 5 drachms.

M. Sig.: Fifteen to fifty drops in water, to be taken morning and evening.

Literature of '96-'97-'98.

Ichthyol is an advantageous sulphur preparation which has excellent influence on the constitution. Remedy prescribed in pill or capsules or in concentrated solution (equal parts of ichthyol and water), the dose of the latter being from 20 to 30 drops three times daily: in pills or capsules, 5 to 8 grains, three times daily after meals. Ichthalbin, a tasteless, odorless form of ichthyol, may be given instead, in doses of 1 drachm, with similarly good results. Jessner (Aerztl. Rundsch., viii, p. 443, '98).

Arsenic bromide in weak doses, $^1/_{60}$ grain, in acne pustulosa. (Piffard.)

Granules containing $^1/_{100}$ grain of arsenic sulphide (Realgar) suggested in acne, psoriasis, etc., as a substitute for other forms of arsenic and for calcium sulphide. One granule to begin with, and the dose gradually increased. McLaughlin (Va. Med. Monthly, May. '91).

Mercurial preparations, such as corrosive sublimate or calomel, either alone or with jalap or colocynth extract, have been found useful.

Ergotine,—alone or with calcium sulphide,—digitalis, belladonna, hamamelis, and quinine have been recommended by Brocq.

Local Treatment.—Constitutional treatment will rarely succeed alone, while in a large proportion a local treatment by itself will be found efficacious.

The treatment resolves itself into (1) preventive treatment and (2) treatment of the established disease.

In the prevention of acne in those predisposed to the disease three things especially are to done: 1. Remove superfluous sebum and epithelial accumulations in the ducts of the glands. 2. Stimulate the sebaceous glands into healthy activity. 3. Keep the skin aseptic, so as to prevent the pus-cocci from gaining admission to the follicles. The soaps with an alkaline basis are the most efficient as they are the most powerful. The most useful soaps are the sulphur, campho-sulphur, Peruvian-balsam, and creolin-cake soaps; while, of the powdered soaps, the alkaline, brimstone, and creolin, and the neutral salicylic-acid-sulphur, and salicylic-acid-resorcin-sulphur soaps are the best.

When the disease is developed all comedones should be expressed and all pustules opened. Stimulating soaps or applications, or both, should then be used. Sulphur is the most important constituent of both. When there is much inflammation around the acneic lesions soothing treatment is necessary, especially at first, while zinc oxide and calamin lotion and belladonna, locally applied, are sometimes of much service. When the more active lesions are remedied the preventive treatment comes into play, and it must be impressed on the patients that, unless they are willing to take the trouble to carry it out in a thorough and continuous manner, they cannot expect to be free from acne. Stephen Mackenzie (British Journal of Derm., Oct., '94).

Literature of '96-'97-'98.

Treatment of acne of young girls should accomplish the following ends: 1. Overcoming of coldness of lower extremities by daily friction with cologne, spirit of camphor, or by flagellations with cold water. 2. Cure of any uterine difficulty. 3. Relief of habitual constipation. 4. Regulation of diet. Small meals with little fluid at a time, and plenty of out-door walking. 5. Avoidance of stiff corsets and stiff collars. Patients should never wash with sponges, but only with swabs of absorbent cotton, wet with a hot solution of borax and soda—two teaspoonfuls of boric acid, and one each of borax and bicarbonate of soda to a quart of water. At night the face should be washed with a naphthol soap. After soap has been used the patient puts on each pustule a small amount of a pomade, prepared as follows:—

℞ Resorcin, 1 grain.
Betanaphthol,
Camphor, of each, 12 $^1/_2$ grains.
Cret. preparat., 15 grains.
Sapon. nigris. 30 grains.
Sulph. præcip., 100 grains.
Lanolin,
Vaselin, of each, 1 ounce.—M.

Next morning patient should wash the face with spirit of camphor, and, if she has to go out, applies a little of following:—

℞ Acidi salicyl., 15 grains.
Zinci oxid., 3 drachms.
Lanolin, 6 drachms.
Vaselin, 12 drachms.—M.

Face is then gently washed and dusted with starch-powder. Brocq (Rev. de Thér., May 15, '98).

Hot water and alcoholic lotions sometimes act promptly. In mild cases these

are applied at night with very hot water, either pure or combined with cologne-water or camphorated alcohol. The water is gradually reduced until pure camphorated alcohol or cologne-water is used. Boric acid or borax may be added to the lotions: 1 part to 50.

Literature of '96-'97-'98.

Apparatus for treatment of acne. Consists of funnel made with double walls, the interval between them is filled with hot water; an outer coating of asbestos surrounds the funnel except below, where a spirit-lamp burns. In the glass of inhalation-apparatus is placed some alcoholic solution of soap mixed with some warm water, and later toilet-vinegar with the warm water. Patient's face is placed at mouth of funnel, and the face may be previously anointed with some alkaline alcoholic solution of soap. The water that condenses on the face and runs down is caught by a little cup and flows away into a vessel. A thermometer on top of funnel marks temperature; if thermometer shows temperature of 131° F., then temperature in interior of funnel will be about 113° F., which is not unpleasant. This apparatus may be used daily or twice a week, and each application may last five minutes or a quarter of an hour. Best results obtained in pustular acne, in acne indurata, and in acne rosacea. Edmund Saalfeld (Ther. Monats., Oct., '98).

Instead of camphorated alcohol there have been used with success:—

Alcohol, 96°, saturated with boric acid, and alcohol with salicylic acid, 1 to 30. The latter is strong and must be used with care.

Mercurial lotions are efficacious in some cases, employed as follows:—

℞ Corr. subl., 1 part.
Alcohol, 90°, 100 parts.
Dist. water or rose-water, 150 parts.

At first this solution is weakened with one-half its quantity of water; afterward, if no irritation results, the water is gradually reduced until the solution is employed pure.

Other mercurial preparations, in ointment form, such as the biniodide, the iodochloride, white precipitate, and mercurial plaster, viz.:—

℞ Hydrarg. iodochloride, 24 grains.
Axungiæ, ½ ounce.
M. Rub in vigorously.

The local action is said to be very energetic. It should, therefore, be used at first with caution. Gailleton (Le Bull. Méd., July, '89).

The ammoniated-mercury ointment, 5 grains or 30 grains to 1 ounce, of great value. Stopford Taylor (Brit. Jour. of Derm., Oct., '94).

Literature of '96-'97-'98.

Face to be washed with water as hot as can be borne and some bland unirritating soap, and then, after carefully drying the skin, following lotion is applied once a day:—

℞ Hydrargyrum bichloridi, 12 grains.
Spiritus vini rectif., 6 ounces.—M.

Effect for first few days will be to render condition worse; but, after this, lotion prevents perforation of pustules. G. Gorden Campbell (Montreal Med. Jour., Apr., '98).

Formaldehyde has recently been tried with success.

Literature of '96-'97-'98.

Case in which intradermal injections of formaldehyde, in strength of 1 drop of the 40-per-cent. solution to 100 drops of water, were used. Injections are attended with a stinging pain. One-half to 1 minim was injected in each point selected, care being taken to pass the needle into, but not under the skin. In a few moments a spot about the size of ten-cent piece presents an elevated surface resembling urticaria. A sufficient number of injections were made at each treatment to thus affect the whole area

of disease and treatment repeated at intervals of one week. Result had been most gratifying. J. T. McShane (Amer. Assoc. Jour.; Ind. Med. Jour., May, '98).

Sulphur preparations are especially useful when much seborrhœa exists. In a few patients sulphur preparations cannot be used, owing to the irritation caused. Sulphur may be employed in the following ways:—

Sulphur-soap: with hot water, the suds being allowed to dry on to the face.

Sulphur-baths.

Sulphur-lotions: hot water with 10 to 60 drops for every one-half-glass of liquid potassium polysulphide.

An effective method of using sulphur is the following:—

After washing with hot water and soap, the following mixture is applied with a camel's hair brush:—

℞ Precipitated sulphur,
Potassium bicarbonate,
Glycerin,
Laurel-water,
Alcohol (60°), of each, 2 drachms.
—M.

The coating is left on during night-time and washed off in the morning with an emulsion of almond-oil, and the skin is covered with oxide-of-zinc or bismuth-subnitrate ointment powdered over with fine starch.

When the skin becomes irritated, the sulphur paste should be discontinued and the zinc ointment applied alone until the irritation has disappeared.

The following are useful:—

℞ Sulphate of zinc,
Sulphuret of potassium, of each, 1 drachm.
Water, 4 ounces.

℞ Precip. sulphur, 4 drachms.
Ether, 4 drachms.
Alcohol, enough to make 4 fluidounces.

℞ Precip. sulphur, 2 drachms.
Gum tragacanth, 20 grains.
Camphor, 20 grains.
Lime-water, 2 fluidounces.
Water, enough to make 4 fluidounces.

Sulphur ointments are usually made in the proportion of 1 in 10, with benzoated lard, simple cerate, vaselin, vaselin and lanolin, lanolin and sweet almond-oil or olive-oil, or castor-oil and cacao-butter.

To the sulphur may be added oxide of zinc in equal parts; borax, 1 to 20; salicylic acid, 1 to 50; naphthol, 1 to 10 or 1 to 20; resorcin or camphor, 1 to 20 or 1 to 40. They may be perfumed with essence of rose, bergamot, or balsam of Peru if desired.

Literature of '96-'97-'98.

After scarification in acne vulgare, compresses wet with a solution of ½ to 1 per cent. of lysol may be applied. At night an ointment containing 10 per cent. of precipitated sulphur and 2 per cent. of pure resorcin and salicylic acid may be applied after the part has been washed with green soap. Editorial (Revue de Thér. Medico-chir., Feb. 1, '98).

Sulphur soaps are sometimes more convenient.

The following may be used:—

Soap and precipitated sulphur, equal parts.

Soap, precipitated sulphur, and juniper-oil, equal parts.

Soap, precipitated sulphur, and lard, equal parts.

Naphthol may be added to the first of the series.

The linimentum saponis is superior to medicated soaps because it can have almost any drug incorporated with it, and can be used pure and undiluted. Nothing removes the seborrhœa sooner. Stopford Taylor (Brit. Jour. of Derm., Oct., '94).

Literature of '96-'97-'98.

In relapsing acne, soap is a skin irritant; its use is entirely out of harmony with a sedative treatment. Equal parts of pusol and dimatos form a powder of considerable curative value. In a week or two the disease will be sufficiently quiescent to justify more stimulative therapeutic measures. Here any of the usual sulphur ointments may be employed, but the application should at first be cautious and at intervals only; or, better, an ointment containing 1½ drachms of pusol to 1 ounce of vaselin. This is rubbed in at night, while the face is dressed with the above-mentioned powder in the day-time. Leslie Phillips (Brit. Med. Jour., Sept. 25, '97).

Among other local treatments recommended are the application to the pustules of tincture of iodine, carbolic acid, nitrate of silver, salicylic acid, or resorcin. An ointment of ichthyol, 1 to 4 or 1 to 8, is also useful.

Results following the application of pure carbolic acid to each pustule most satisfactory. Very bad cases are soon benefited if the applications are carefully made. P. Abrahams (Brit. Jour. of Derm., Oct., '94).

Resorcin-sublimate paste of great value. Unna (Brit. Jour. of Derm., Oct., '94).

Resorcin has been made use of in the treatment of ichthyosis and acne. W. Allan Jamieson (London Lancet, Sept. 12, '91).

The following resorcin paste is recommended:—

℞ Resorcin, 2½ to 5 parts.
Zinc oxide,
Starch, of each, 5 parts.
Vaselin, 12½ parts.—M.

This paste may remain on a day and a night and then be removed with a piece of cotton. Cure is said to be speedy, occurring in three or five days.

Salicylic acid acts well in from 1 to 2½ per cent. in various ointments.

Combination of the iodides and bromides of potassium with soap, the latter possessing keratolytic qualities. Two varieties: strong soaps containing from 2 to 6 per cent. of sodium iodide and from 1 to 3 per cent. of potassium iodide; weak soaps, containing but from 1 to 3 per cent. of potassium iodide and bromide. Useful to allow suds to dry upon site of application. Bardach (Lyon Méd., June 23, '95).

[New treatments should be used with much prudence and with due thought to the susceptibility of the patient; there is a tendency to reject preparations of the iodides and bromides in acne, because these substances cause acne in many persons; yet in some rare cases I have personally noted improvement in acne to follow the use of minute doses of sodium or potassium iodide and of applications of tincture of iodine; it must never be forgotten, however, that idiosyncrasy may play a most important part in any medication. L. Brocq, Assoc. Ed., Annual, '96.]

Electrolysis has been recommended for the removal of the indurated masses left on the skin.

Case in which a current from dry Leclanché cells was used to remove indurated lesions left in the cheeks after thirteen years of the disease. The strength of the current did not exceed 3 milliampères, but the treatment was repeated in cases of large nodules. The needle connected with the negative pole was inserted deep into the centre of the induration. There was no return in the points treated and no resultant scarring. J. F. Payne (Brit. Jour. of Derm., May, '94).

In acne of the back the strongest applications, as a rule, are demanded. Of especial value in some cases is the liquor calcis sulphuridis (Vleminckx's solution). This should be used at first diluted.

Massage of the face has recently been recommended.

Massage of face recommended. Hands previously warmed in warm water and

rubbing exerted so as to cause removal of accumulated secretions. Rice powder then dusted over the face. Sittings twice daily and of ten minutes' duration. Pospieloff (Revue Gén. de Clin. et de Thér. Jour. des Prat., Sept. 28, '95).

Literature of '96-'97-'98.

Massering-ball for use in the local treatment of acne. A ball set in a steel socket, the small sphere rotating within the cup of the latter, as in the ordinary ball-and-socket joint. The skin is first operated upon with disinfected needle and comedo-extractor, until all pustules and subepidermic foci are emptied. The surface is then rendered aseptic with a solution of formalin (40 per cent. of formic aldehyde), ½ per cent. to 2 per

Massering-ball. (*J. Nevins Hyde.*)

cent., according to the sensitiveness of the patient's face. The massering-ball then rotated freely over the surface, and deep pressure made upon the affected region. James Nevins Hyde (Jour. Cut. and Genito-Urin. Dis., Mar., '96).

Before undertaking the local treatment of acne it is well to open the pustules, empty the comedones and sebaceous cysts, etc. Other direct surgical measures consist in cauterizations with the hot needle or electrolytic needle or in scarifications. These are often satisfactory in indurated and rebellious acne.

Facial wounds heal so quickly that it is better to break up the acneic nodule by incision than to puncture it with a needle. Stopford Taylor (Brit. Jour. of Derm., Oct., '94).

Henry W. Stelwagon,
Philadelphia.

ACNE ROSACEA.

Definition.—Acne rosacea is characterized by a chronic congestion of the face, causing vascular dilatations; and by changes in the cutaneous glands and tissues, giving rise to seborrhœa, inflammatory acne, and hypertrophic changes.

Symptoms.—The nose and malar eminences are especially prone to this disorder. It may also affect the forehead, chin, the neighborhood of the alæ nasi, the cheeks, and less commonly the side of the neck. In women the chin is occasionally invaded.

There are three forms of acne rosacea.

The first is the *erythematous and telangiectasic*. It may be characterized by temporary congestive spots on the face, showing themselves especially after meals and in the evening. These spots may be accompanied by no other lesion. This form is usually present in connection with more or less seborrhœa, especially on the nose, which is generally very oily. Again the erythematous variety may be characterized by small vascular dilatations on the nose or malar eminences, which dilatations develop gradually, unite with one another and form a net-work. This net-work is uniform in hue at a distance, but near by may be seen to be formed of congested surfaces over which are spread vascular dilatations. This degree of the erythematous form is almost always accompanied by seborrhœa, enlarged nose, and dilated glandular orifices, especially in women toward the menopause and in wine-drinkers. (Hebra.)

The nose may become slightly violet-hued and be cold to the touch.

The second form is the *erythematous* acne, *or true acne rosacea*. In addition to the erythematous and congestive feature, there may be found in this variety a true acneic element, papules and pustules. In some cases the acne appears before the congestion. There is a congestive red base with fine vascular dila-

tations and papulo-pustules of various sizes, often resting on an indurated violet-red base.

In this variety there may also be increase in number and size of the vascular dilatations, increase in size and depth of the acneic indurations, and proliferation and hypertrophy of the derma.

The third form is the *hypertrophic* acne, or *rhinophyma*. In this variety the glandular orifices are much enlarged, while the glands themselves may be ten to fifteen times increased in size. The tissues around them proliferate, forming a variety of pachyderma. The nose may be red or violet-hued, covered with enlarged orifices, greatly increased in size, falling down to the chin. Its exterior may be mammillated. (Brocq.)

Two subdivisions of this form are rendered necessary by the difference in the pathology of each. The first, glandular, presents an embossed aspect, the hypertrophy being due especially to hypertrophy of the pilo-sebaceous glands; the second, elephantiasic, presents a smooth aspect, being due to chronic œdema; there are vascular dilatations, with sclerosis of the derma. (Vidal and Leloir.)

Etiology.—Women suffer more than men from the erythemato-telangiectasic and acneic forms. Men only suffer from hypertrophic acne. It usually appears between 30 or 40 years. In women, rosacea develops usually at from 30 to 45 years, and increases decidedly toward the menopause, after which it may recede. It may also, however, develop at puberty. In young women and girls it is frequently due to chlorosis, dysmenorrhœa, or sterility. In some it recurs at each conception.

Some authorities claim that among the constitutional causes (which affect women more than men), heredity plays an important part. The disease is said to be more frequent in children of arthritic subjects, or of those who may have suffered from acne rosacea.

Cold feet, urethral and uterine disturbances, and constipation are also recorded as causes of the disease. The cause of acne may be found in the mouth or teeth and be unilateral if the cause is one-sided. (E. Besnier, Doyon).

Dyspepsia, neuralgia, hemicrania, working with the head inclined forward, and disease of the nasal fossæ are among the less frequent etiological factors (which affect men more than women), while high heat, overheated rooms, high wind, sea-air, cold, and cold water are occasional causes, especially in men. The disease may become started in people who for several years have indulged in excessive hydrotherapeutic treatment (Kaposi).

Certain occupations—such as those of coachman, baker, smith, fireman, glass-blower—may also become primary causes of the trouble. Indiscretion in diet and alcoholic beverages are well-known factors.

According to Kaposi, in wine-drinkers the nose is bright red, in beer-drinkers it is violet, while in spirit-drinkers it is soft, large, and dark blue.

Pathology.—The vascular dilatations of the face have been considered by some authorities as due to circulatory troubles caused by compression of the veins in the cranial foramina.

A certain paretic condition of the vascular walls may often be looked upon as a cause. (Brocq.)

The cutaneous nerves of the region affected have been found normal by E. Besnier. According to Leloir and Vidal, however, there is congestion of the deeper venous net-work of the skin: dilatation of the same vessels and of the perifollicular vascular net-work, their

walls being often diminished in thickness. There is also formation of new vessels.

Diagnosis.—Lupus Erythematosus.—The superficial, congestive variety shows a brighter and better defined redness; crusts or squamæ on the surface; sharper and more definite edges; greater sensitiveness to pressure; slight elevation above the surrounding surface. If any cicatrix be present, it is surely lupus erythematosus.

Circumscribed Congestive Seborrhœa.—In this disorder there is a limited extent of patches, shallower and more uniform redness, with crusts covering them.

Literature of '96-'97-'98.

A new form of acne seen in two middle-aged women. In the first case there were small, red papules on the face, and especially the nose. After a time plaques were formed by their coalescence, and on these appeared thick scales. The skin was not infiltrated, and the rose color disappeared under pressure. A linear formation appeared on the lips and chin. Tiny vesicles sometimes surmounted the papules, and the fat secretion was increased over the region. There was no sign of telangiectasis. In the process of absorption the lesions exfoliated and left no cicatrices. The mucous membrane of the lower lip was congested and covered with dry desquamation; the same condition was present at the nasal orifices. There was slight itching.

The lesions in the second case had lasted ten years and were worse in winter. She suffered from a milder affection than the first. The author excludes seborrhœa congestiva because he watched the evolution of the acneic elements. The disease yielded to treatment with sulphur and ichthyol in four to six weeks. Petrini (Jour. Cut. and Genito-Urin. Dis., Apr., '97).

Keratosis pilaris is recognized by its inframalar and preauricular location, and the file-like feeling, to the finger, of the erythematous and telangiectasic patches.

Sycosis Non-parasitica.—This is always an inflammatory disease of the hair-follicles and perifollicular tissues. There are numerous papules and pustules, each perforated by a hair, and often capped by a small circular scale. The upper lip and chin are sites of predilection. The affection is usually painful.

Congenital adenoma sebaceum also has a special location: the naso-genial furrow, the parts around the nose, mouth, and chin. It presents a mamelated aspect, and its predilection for early youth and its normal evolution serve to establish its identity.

Eczema.—Erythematous, or pustulopapular, eczema of the face may sometimes present diagnostic difficulties. In this disease, the more or less constant, and usually intense, itching, the serous or sero-purulent secretion, and the desquamation will suffice to establish the diagnosis.

Psoriasis of the Face.—Diagnosis is also frequently difficult in this disorder. The patches are better defined and are generally covered by silvery-white scales situated on a red base, which bleeds easily on scratching. The presence of typical psoriasic patches on other portions of the body is an important sign.

Chilblains.—Changeableness of the lesions and pain are peculiar to this disorder.

Acneiform Syphilides.—Here the manner in which the elements are grouped, the long duration of their evolution, their tendency to ulceration, and consecutive cicatrix are important. Complete failure of acneic remedies is another diagnostic point.

Rhinoscleroma.—In this disorder

there are hard or ivory-like masses imbedded in the nose.

Prognosis.—Acne rosacea does not always increase; it may remain stationary or even recede, especially in women after the menopause. It may also, however, assume malignancy, but this sequel is very rarely met with.

> Case of a man, 67 years old, with a well-marked hypertrophic acne of the nose; one of the masses having been removed by ligature, an epitheliomatous ulcer supervened, and the growth gradually took on epitheliomatous transformation. Matignon (Jour. de Méd. de Bordeaux, Dec. 6, '91).

Treatment.—As to general treatment, it is especially necessary to pay strict attention to the good condition of the stomach and intestines, by appropriate measures and suitable diet. Purgatives are absolutely necessary from time to time; laxatives should frequently be given and constipation should be avoided (Brocq).

Proper circulation of lower limbs should be insured by adequate clothing. Any abnormal condition of the genito-urinary tract or of the upper respiratory tract, especially the nose, should be corrected, while anything tending to cause congestion of the face, such as tight collars or stays, should carefully be avoided. Sedentary intellectual work, especially by gaslight, frequently aggravates these cases.

As a rheumatic diathesis is a dominant etiological factor, various alkalies have been recommended, especially bicarbonate of soda or the various alkaline waters.

Where the face is intermittently congested, quinine, ergotine, belladonna, digitalis, and hamamelis have seemed useful. These may be combined in a mixture, with or without the tincture of aconite-root. Vasoconstrictor drugs have but little influence.

Perchloride of iron, tannin, ergot, and tincture of hamamelis are recommended by E. Besnier and A. Doyon.

The following preparation is extolled by Brocq:—

℞ Quinine hydrobromate,
Ergotine, of each, 30 grains.
Belladonna extract, 6 to 12 grains.
Lithium benzoate, 30 grains.
Excipient and glycerin, q. s.

M. For forty pills.

Sig.: Two before each of the two principal meals.

Rhubarb or aloes may also be added if necessary.

Amyl-nitrite may be inhaled or taken internally by patients suffering from congestive attacks of the face. (Sidney Ringer.)

The local therapeutic agents are the same as in acne vulgaris; though some irritable varieties of acne rosacea exist, it is usually necessary to act with greater energy.

Hot water and mercurial preparations are often of value. Mercurial ointment may be rubbed in pure or weakened with lard, twice daily, according to individual susceptibility. (Hardy.)

The following has been employed by Bazin with success:—

℞ Mercury biniodide, 7½ to 15 grains.
Lard, 1 ounce.—M.

> Ten grains of mercuric green iodide to the ounce often gives good results. Purdow (Dublin Jour. Med. Sci., May, '94).

Sulphur preparations are also useful: but, as the preparations should be strong enough to cause irritation of the integuments, it is well to use sulphur pastes mixed with green soap.

In cases of average intensity derma-

tologists frequently employ Vleminckx's solution, at first with 5 parts of water, then gradually making it stronger until it is used pure. It should be left on several minutes, and followed by very hot water.

Green soap gives the best result in obstinate acne rosacea, alone or when used in conjunction with sulphur, naphthol, or salicylic acid. It may be used as in acne vulgaris or spread on a piece of flannel; the latter is then cut out to fit the affected region, and left on as long as possible. When the irritation becomes too great, the application should cease and cooling preparations, such as the following, be used:—

℞ Salicylic acid, 7 grains.
Zinc oxide,
Bismuth subnitrate, of each, 30 grains.
Lycopodium, ½ drachm.
Vaselin, 2 drachms.
Lanolin, 3 drachms.

Ichthyol does not seem to be as efficacious in acne rosacea as in some other varieties of acne (Brocq).

Ichthyol is often better than sulphur as a reducing agent. Purdow (Dublin Jour. Med. Sci., May, '94).

Unna recommends daily doses of 7½ grains of ichthyol internally and lotions with ichthyol dissolved in water, washing with ichthyol-soap. Steam or sulphur-water douches, pyrogallic acid, and chrysarobin have also been used with good results. Turpentine has also been found efficacious.

Literature of '96-'97-'98.

Turpentine has a solvent action on the sebaceous secretion; it also exerts a disinfecting action that prevents the spread of the affection. Cases in which it proved very efficacious. It produces violent smarting and redness, but these effects disappear in a few hours. Betz (London Lancet, Jan. 30, '97).

Liquor gutta perchæ may be used to exert pressure on the vessels and thus encourage resolution of the parts.

A solution of iodine in glycerin, applied twice daily during three or four days, is recommended by Kaposi.

Literature of '96-'97-'98.

Treatment of acne rosacea is divided into constitutional and local. In women any menstrual disorder should be corrected, all alcoholic stimulants should be stopped, and good plain diet taken. If tongue is very coated alkaline bitter tonic should be ordered. When skin is much thickened, and there are many acne papules and pustules, German green soap is best, used with hot water, and a piece of white flannel, every night, until the skin begins to peel considerably. In less severe cases white Castile soap is good. Five-per-cent. resorcin soap (Eichoff's) is very efficacious. Prescription for an ointment is as follows:—

℞ Sulph. præcip., 1 to 4 drachms.
Acidi salicyl., 10 to 30 grains.
Ol. amygdal. dulcis, 1 drachm.
Lanolin, 1 ounce.

M. Sig.: Apply at night after washing. (The salve should not be gritty, but perfectly smooth.) T. C. Gilchrist (Maryland Med. Jour., Dec. 10, '98).

Blisters, left on but four or five hours, are used by some dermatologists.

After attending to diet and any gastric disturbances, "bathe parts in morning with spirit of horse-radish, and at bed-time rub in pretty firmly a pomade of sulphur with a small quantity of carbolic acid." Purdow (Dublin Jour. Med. Sci., May, '94).

Surgical treatment in this disease is the most efficacious. (Brocq.)

Kummerfeld's solution, used in varying strength according to severity of case, will be found efficacious, especially in connection with scarification:—

℞ Sulph. præcip., 1 to 3 drachms.
Pulv. camph., 5 grains.
Pulv. tragacanth., 10 grains.
Aquæ calcis, 1 ounce.
Aquæ rosæ, 1 ounce.

M. Sig.: Apply after washing at night.

Scarification or the application of the electric needle is a very necessary adjunct to the treatment.

Scarification can be done in three ways: 1. By linear scarification. 2. By slitting up the dilated cutaneous blood-vessels. 3. By puncturing rapidly. The third plan is best. T. C. Gilchrist (Maryland Med. Jour., Dec. 10, '98).

In typical acne rosacea the pustules are first emptied, then cauterized with a fine-pointed thermo- or galvano- cautery. Vascular dilatations promptly yield to cauterization with a very fine point heated by electricity or a simple needle heated in the fire.

The larger veins can be destroyed by drawing the point of the Paquelin cautery along the length of the vessels from their root to the beginning of the first ramification. Unna (Jour. des Mal. Cut. et Syph., July, '91).

Electrolysis is another satisfactory method. A fine platinum needle is inserted alongside of the vessel, and if possible, into it, and connected with the negative pole, while the patient holds in his hand a cylinder in communication with the positive pole. A large eschar must be avoided. (Hardaway.)

The ordinary galvanic or faradic currents have been recommended by Cheadle and Piffard.

Scarification is a favorite method. The best instrument is Vidal's ordinary scarificator. The skin is cut obliquely or perpendicularly to the vessels, then slightly obliquely across these so as to form lozenges, and as near together as possible (from one to one and a half millimetres apart), and not deep enough to penetrate entirely through the dermis, so as to avoid cicatrices.

An hour afterward the part is washed with a corrosive-sublimate solution, 1 to 1000; then in the evening or the following day compresses dipped into an ammonium-hydrochlorate solution, 1 to 100, or corrosive sublimate, 1 to 500, are applied. If too strong, warm water is to be added. If the reaction is too violent, starch-poultices, bland pomatums, or zinc-oxide plasters can be employed.

The treatment should be renewed in from five to eight days. Amelioration will occur in from eight to ten sessions; and marked improvement in from fifteen to twenty-five sessions.

Scarifying should be begun in the lower part of the region to be operated upon, in order not to be troubled by the blood covering the surface. (E. Besnier, A. Doyon.)

In the early stage of hypertrophic acne the scarification must be made deeper, and in many cases it is essential to also cauterize the glands deeply.

Electrolysis of each dilated sebaceous follicle with a negative platinum needle and a current of from 4 to 6 milliampères is an effective, though tedious, measure. The needle should be moved around in the follicle in order to thoroughly destroy it. In the advanced hypertrophic form direct removal with the knife is the best procedure. (Brocq.)

Hypodermic injections of alcohol have recently been recommended.

Literature of '96-'97-'98.

Local subcutaneous injections of 95-per-cent. alcohol. The part is compressed with the fingers, and 20 or 30 drops of alcohol injected with a clean hypodermic syringe with a thin needle. The immediate effect of the injection is a local swelling and anæmia, lasting but a few moments; then an increased red-

ness lasting from half an hour to three or four hours; this gradually disappears, and the treated skin-area assumes normal color. The dilated blood-vessels and papules, after repeated injections, undergo slow obliteration, until finally the whole lesion disappears and the affected integument appears normal. The treatment, in some cases, lasts eight or ten weeks; in others, a great deal longer. R. Abrahams (Amer. Med.-Surg. Bull., May 16, '96).

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ACONITE.—The preparations of aconite usually employed are obtained from the root of the *Aconitum napellus* (monk's hood), a conical tuber greatly resembling horse-radish. This resemblance has caused many deaths. When scraped, however, aconite-root does not emit the pungent odor peculiar to horse-radish. Again, instead of irritating the palate, as does horse-radish, aconite-root, when masticated, soon produces in the mouth a sense of warmth and tingling soon followed by local numbness varying in duration according to the length of time the mucous membrane is exposed to the effects of the drug.

The active principle of aconite, aconitine, will be considered in the next article.

Preparations and Dose.—Aconite in substance is not employed and the preparations made with the leaves are no longer official.

The tincture (tinctura aconiti rad., U. S. P.) is three times stronger than either the English or French tinctures. Dose, 1 to 3 minims, every three hours. Its effects should be closely watched, especially in anæmic and corpulent individuals and in those addicted to alcohol.

Fleming's tincture is no longer official and should not be employed.

The fluid extract (extractum aconiti fluidum, U. S. P.), $\frac{1}{2}$ to 2 minims, every three hours.

The solid extract (extractum aconiti, U. S. P.), $\frac{1}{4}$ to $\frac{3}{4}$ grain.

Physiological Action.—Within half an hour after its administration the drug commences to affect the general system, slowing and weakening the heart's action, lowering arterial tension, increasing the action of the skin and kidneys, and producing more or less muscular weakness in proportion to the amount taken. It causes a tingling sensation in the lips, extremities, and, perhaps, the whole body; it diminishes the rapidity and depth of the respiration, and causes disorders of vision and loss of tactile sensibility and sense of pain. According to Wood, aconite, when administered in sufficient dose, is a powerful depressant of the sensory nerves; and there is some reason for believing that the stage of nerve-paralysis is preceded by one of nerve-stimulation. Subsequently, however, its actions on the spinal cord was further ascertained and Bartholow states that aconite affects the sensory nerves before the motor. It paralyzes first the end-organs, next the nerve-trunks, and finally the centres of sensation in the cord. It also impairs the reflex function of the cord, but, doubtless, secondarily as regards the sensory paralysis. The power of voluntary movement, which continues after the cessation of the reflex functions, is finally lost, owing to the action on the motor centres of the cord, and subsequently on the nerve-trunks.

When aconite is applied directly to the heart, the number and force of the beats are lessened, and its action is finally arrested in diastole. It lowers the blood-pressure and pulse-rate when given internally by a direct action on the heart itself. Bartholow concludes that it is a

direct cardiac poison, affecting its ganglia and muscle, and also a sedative to the vasomotor nerve-system. Hare calls attention to the fact that the fall in pulse-rate from poisonous doses is sometimes preceded by a quickening due to a condition of weakness and abortive cardiac action. All agree that it is a respiratory poison by direct action on the muscles of respiration, but that the heart ceases before the respiratory movements.

Aconite reduces the temperature when given in health. Bartholow tells of a medical student poisoned with aconite, in whom the temperature fell two degrees. It also increases the action of the skin and kidneys, and with the increase of water there is augmentation of the solids excreted. (F. E. Stewart.)

Aconite Poisoning.—The symptoms following the ingestion of a poisonous dose usually show themselves after a few minutes. The tingling, pricking, and numbness already mentioned rapidly extend from the mouth and fauces to the face, thence to the body. Speaking requires marked effort. Great prostration and muscular impotency follow, and the skin becomes cold and clammy, the perspiration covering the surface, and the cold tissues communicating to the hand an icy coldness. Muscular pains may be present in the early stages, especially in the face. There is usually experienced marked epigastric pain with nausea and vomiting. Later on, however, the nausea ceases, owing to paralysis of the stomach-walls.

The heart-beats are greatly reduced in number and power; the pulse is usually irregular, compressible, and slow, and so weak, at times, as hardly to be felt. The breathing is labored, irregular, and shallow, the number of respirations being at first decreased then increased. The temperature may be considerably lowered.

The pupils may be dilated or remain of normal size and react equally. The eyes may protrude or be sunken; therefore they afford no differential information as to the nature of the drug.

The mind is usually clear, and the patient calm, though apprehensive of impending death. Occasionally, epileptoid convulsions occur. Spasmodic purging, the stools being sometimes bloody, and rectal tenesmus are frequently present.

Aconite causes paralysis of respiration and circulation, death usually being due to sudden arrest of the heart in diastole.

> Personal case of death following a minimum dose. There are many cases of individual intolerance, and syncope may occur in certain patients from small quantities. Ferrand (La France Méd., Dec. 8, '93).
>
> Case of poisoning from tincture of aconite-root. Two doses of 1 minim each, given one hour apart, produced tingling, mild delirium, diplopia, and other indications of aconite poisoning. Frank Woodbury (Phila. Med. Times, Jan. 1, '90).

Treatment of Aconite Poisoning.—Death in these cases usually follows exertion by the patient. He should, therefore, be kept perfectly motionless in the recumbent position even during emesis, his head being slightly turned and the dejections received on a towel. An important feature of the treatment is to keep the patient as warm as possible by means of warm blankets and hot-water bottles, taking care not to place the latter against the skin. The head should also be kept warm. If the patient is seen early the stomach-tube should be used at once to empty the stomach. If no stomach-tube be at hand, apomorphine, $^1/_{12}$ to $^1/_6$ grain, should be administered hypodermically, or some other

active emetic, such as zinc sulphate, 15 to 30 grains, be given by the mouth.

Literature of '96-'97-'98.

A point of practical importance, not mentioned in the text-books, is that of wrapping up the head and applying heaters there. This apparently gives especial comfort to the patient. Elevating the foot of the bed is of some use. R. W. Greenleaf (Boston Med. and Surg. Jour., July 15, '97).

Digitalis, sulphate of strychnine, and belladonna are the most effective remedies, but ether and ammonia should first be employed, owing to their great diffusibility. All these remedies should be used hypodermically, the stomach being unable to perform its functions. A drachm of ether, ammonia, brandy, or whisky should at once be injected, and, after a few minutes, tincture of digitalis, 15 minims; strychnine sulphate, $^1/_{20}$ grain; or tincture of belladonna, 10 minims, according to what the practitioner may have. The dosage should be regulated so as to reach the point of physiological action by frequently-repeated doses. Nitrate of amyl may be given by inhalation, and warm, very strong coffee be injected into the rectum.

If the patient is seen when the stage of depression has begun through absorption of the poison, the stomach-pump should alone be used, emetics at this stage being liable to cause arrest of the heart's action. Tincture of digitalis, in 20-minim doses, should be injected hypodermically and repeated as required, besides the other measures indicated. Frictions under cover, the rubbing being directed toward the heart, serve a useful purpose.

Literature of '96-'97-'98.

Twenty cases, six of which were fatal, found in the literature of the last ten years:—

Case 1. Tincture, 7 drachms. Recovery. Emetics; morphine, ½ grain; fluid extract of digitalis, 6 drops; strychnia sulphate, $^1/_{100}$ grain; brandy, 1 ounce; all hypodermically. By the mouth, 2 gallons of warm water; fluid extract of digitalis, 20 drops; coffee, 11 pints; whisky, 3 pints; extract nucis vomica, ½ fluidrachm; Port wine, ½ pint. P. F. Brick (Jour. Amer. Med. Assoc., vol. viii, p. 567, '87).

Case 2. About 8 drops of concentrated fluid extract. Recovery. Emetics, coffee, whisky (dessertspoonful). Heat. Friction and sinapism. T. H. P. Baker (Amer. Pract. and News, vol. iv, N. S., p. 122, '87).

Case 3. Fleming's tincture, 1 ½ ounces. Recovery. Emetics, brandy, ether, digitalis, ammonia carbonate. Amyl-nitrite and warmth. C. C. Bradley (N. Y. Med. Record, vol. xxxii, p. 155, '87).

Case 4. Tincture, ½ ounce. Recovery. Brandy by mouth and hypodermically. Ether. One quart of cold, black coffee. Heat and posture. S. Barnett (N. Y. Med. Record, vol. xxxii, p. 761, '87).

Case 5. Amount not known. Patient intoxicated at the time. Symptoms of acute poisoning. Recovery. Emetics, brandy, ammonia, and digitalis by the mouth. Sixty minims of tincture of digitalis hypodermically. Heat. Clara T. Dercum (Med. and Surg. Reporter, vol. lxi, p. 376, '89).

Case 6. Tincture, amount not known. Child, 16 months. Marked toxic symptoms. Recovery. Brandy and fluid extract of digitalis frequently repeated in spite of vomiting. Byron F. Dawson (Med. and Surg. Reporter, vol. lxii, p. 7, '90).

Case 7. Tincture, 2 drachms. Death. Benjamin Edson (N. Y. Med. Record, vol. xxxviii, p. 365, '90).

Cases 8, 9, and 10. Dr. Edson mentions certain other cases known of, but not treated by him, three of which died. The amounts taken in these were from 1 to 4 drachms.

Case 11. Tincture (B. P.), 1 ounce. Death in sixty-five minutes. Mustard, lavage, heat, ether, and brandy subcutaneously. L. M. Whannel (Brit. Med. Jour., vol. ii, p. 791, '90).

Case 12. Fleming's tincture, 1 drachm. Recovery. Sulphate of zinc, tincture of digitalis, 20 minims hypodermically. Whisky, 1 ounce, by the mouth, followed by calomel, 8 grains. L. M. Whannel Brit. Med. Jour., vol. ii, p. 791, '90).

Case 13. Fleming's tincture, 1 teaspoonful. Recovery. Mustard, spirit of ammonia comp. (B. P.), tincture of belladonna, brandy. T. F. H. Smith (Brit. Med. Jour., vol. i, p. 1109, '93).

Case 14. Fluid extract, 4 drachms. Recovery. Emetics, atropine and brandy subcutaneously. Henri E. R. Altenloh (N. Y. Med. Jour., vol. lxvii, p. 358, '93).

Case 15. Tincture, 7 1/2 drachms. Recovery. Mustard, digitalis, and brandy subcutaneously; digitalis, nux vomica, and brandy by rectum; ether and ammonia by inhalation; brandy and ammonia carbonate by mouth later. G. H. Tuttle (Boston Med. and Surg. Jour., vol. xxv, p. 678, '91).

Case 16. Mentioned by, but not seen, by Dr. Tuttle. Tincture, 5 1/2 drachms. Death. G. H. Tuttle (Boston Med. and Surg. Jour., vol. xxv, p. 678, '91).

Case 17. Preparation not noted. Four teaspoonfuls. Recovery. Sulphate of copper, digitalis, wine by mouth; whisky by rectum; whisky, 1/25 grain strychnia, and digitaline, 1/50 grain, hypodermically. M. A. Warriner (N. Y. Med. Record, vol. xxxix, p. 521, '91).

Case 18. Tincture, 2 drachms. Recovery. Apomorphia, stomach-tube, tincture of digitalis, 25 minims; aromatic spirits of ammonia, 45 minims; brandy, 2 drachms subcutaneously, heaters, sinapism to præcordia. S. Q. Robinson (Boston Med. and Surg Jour., vol. cxxvii, p. 192, '92).

Case 19. Tincture (B. P.), 30 minims. Recovery. Salt and water one and a half hours after poison. Sulphate of zinc two hours after poison. Charcoal, brandy, and water by mouth. William Hardman (Brit. Med. Jour., vol. i, p. 1320, '93).

Case 20. Preparation not stated. Five drops. Recovery. Belladonna and strophanthus, champagne, brandy, heaters. J. D. Leigh (Edinburgh Med. Jour., vol. xl, p. 638, '95).

Reported by R. W. Greenleaf (Boston Med. and Surg. Jour., July 15, '97).

Therapeutics.—Aconite is mainly used as an arterial sedative. By diminishing the force and the rapidity of the heart's action, it lessens blood-pressure, and, in doing this, tends to allay spasm and relieve undue excitability of the nerve-centres. It is, therefore, indicated while the pulse is high and resisting.

Aconite causing increased perspiration, it is indicated where, with a high pulse, there is dryness of the skin. The evaporation of sweat from the surface and the heat-radiation due to the increased peripheral circulation resulting from relaxation of the cutaneous capillaries also cause a reduction of temperature. Aconite also possesses diuretic properties. Hence it appears to be endowed with all the qualities requisite in the incipient stage of uncomplicated inflammatory disorders, as an anodyne sedative.

In children aconite may be given whenever the spasmodic element is clearly marked: in fever preceding attacks of quinsy, pharyngitis, etc.; in asthma and the asthmatic crises of bronchial adenopathy; in pertussis and other spasmodic coughs; in laryngismus stridulus; in palpitations associated or not with hypertrophy of the heart; and in convulsions. (Comby.)

> The tincture of aconite may be used with safety for the reduction of the temperature when dangerous symptoms, as restlessness, jactitation, and delirium (which are forerunners of eclampsia or coma) are present. A child of 8 years could take 1 minim, and one of 12 years 1 1/2 minims every three hours. J. Lewis Smith (Archives of Pediatrics, Dec., '91).

By reason of its sedative and depressant action aconite is contra-indicated in all cases in which prostration exists or threatens. If the respiration is embar-

rassed, if the heart is in asystole, if the patient is depressed, recourse must be had to tonics and stimulants. In broncho-pneumonia, pneumonia after the primary stage, valvular affections of the heart, and in all cases of collapse occurring in acute infectious diseases, aconite is particularly contra-indicated.

Fever.—The physiological effects enumerated afford sufficient ground for its value in the reduction of all the phenomena attending the febrile state,—high temperature, dry skin, hard and frequent pulse, etc. The tincture is preferable here, as it is in all other disorders. The best effects are produced by means of small doses. One minim is first given, then another minim in one-half hour. After that, ½ minim is given every half-hour until the febrile symptoms are reduced or until physiological symptoms of the drug appear. Aconite should always be greatly diluted.

Aconite is especially of value in the fever attending the incipient stage of catarrhal disorders. It may be used as an apyretic in continued fevers and infectious diseases, — variola, scarlatina, erysipelas, etc.,—but large doses are usually required, involving correspondingly great danger.

In the reflex fever which sometimes follows the use of the catheter, it is very efficient. (Wood.)

Disorders of the Respiratory Tract.—In acute disorders of the nose, throat, and lungs the depressing effects exerted by aconite upon respiration through its influence upon the respiratory centre and upon the muscles concerned in respiration are added to the qualities previously enumerated. Hence its value in acute coryza, pharyngitis, tracheitis, bronchitis, pleurisy, and pneumonia. In all of these, 1 drop of the tincture every hour should be administered until the physiological effects—tingling and numbness of the lips and tongue—are experienced, when the remedy should be given less frequently. After the initial stage of the affections enumerated, aconite should be discontinued, especially in pneumonia, in which affection its administration is positively harmful as soon as the asthenic stage begins. In the chronic disorders of the respiratory passages—including phthisis—it is more hurtful than beneficial.

Rheumatism.—Aconite is considerably used in all forms of rheumatism as an anodyne. It is especially indicated when the skin is dry. The diaphoresis resulting from its use, added to its analgesic effect, tend to shorten the duration of the disease. This is especially the case in the acute rheumatic pains due to exposure.

Neuralgia.—In the form of neuralgia characterized by exacerbations during damp weather aconite is sometimes very effective in small doses frequently repeated. If the painful spot does not cover much surface, application of the tincture over it with a camel's-hair pencil contributes markedly to hasten the relief.

Meningitis, Pericarditis, and Peritonitis.—These three inflammatory disorders of serous membranes are mentioned concurrently owing to the fact that their early manifestations are equally influenced by aconite. In peritonitis especially its effect as an anodyne tends to prevent vomiting, an important feature. In pericarditis it markedly increases the chances of recovery by reducing the number of pulsations, thus prolonging the resting periods between beats.

Cardiac Disorders.—By lowering arterial tension and diminishing the

number of heart-beats it may be of advantage in functional disorders, but when organic lesions are present it had better not be used. It is sometimes employed in uncomplicated hypertrophy, however, to antagonize exaggerated action, but its effects should be closely watched lest incipient degeneration be present.

ACONITINE.—Aconitine is an alkaloid obtained from *Aconitum napellus*, and represents the active principle of aconite. It occurs in colorless, tabular crystals, slightly soluble in water, but soluble in alcohol, ether, and chloroform. It is extremely poisonous.

Dose.—The preparations entitled to confidence are those of Merck and of Duquesnel, the latter, especially, owing to its constant strength. The German preparations of aconitine are thought to be impure. The dose is from $^1/_{300}$ to $^1/_{250}$ grain.

The virulence of aconitine causes the responsibility of the physician to be involved to a greater degree than in the case of other poisons. It should be administered in small doses only, if used at all.

> Case of fatal poisoning by a single dose of aconitine in France. Physician fined 100 francs. Editorial (Gaz. des Hôp., Paris, Sept. 8, '91).
>
> Nitrate of aconitine given by practitioners in doses of $^1/_{32}$, $^1/_{22}$, and $^1/_{16}$ grain. These relatively large quantities are apt to be followed by serious results. Editorial (Medical Age, May 25, '92).

The activity of aconitine is markedly increased when it is administered hypodermically.

> Injections of the alkaloid in various neuralgias excessively painful and productive of toxic symptoms. A. Cohn (Deutsche med.-Zeit., Oct. 22, '88).
>
> From experiments on rabbits and dogs it was thought that as much as $^1/_3$ grain of aconitine could be given to the horse, whereas half that dose would be fatal. It is, therefore, illogical to calculate the toxicity of a poison by the weight of an animal, and still more so to draw conclusions as to one species from experiments on another. Aconitine possesses great activity when given by hypodermic injection. Weber (Le Bull. Méd., Mar. 20, '95).

The fact that the preparations dispensed vary greatly in strength according to the source of production militates against its use.

> Especial attention called to the various degrees of strength of the several varieties of aconitine on the market. The division into French, German, and English aconitine is as unreliable as it is unscientific. William Murrell (Medical Bulletin, June, '90).

Physiological Action.—Aconitine in minute doses reduces the action of the heart and thereby reduces arterial tension. In large doses, or in persons presenting undue sensitiveness to the effects of aconite, this action manifests itself more markedly, reaching, in fatal cases, to arrest of the heart in diastole. Aconitine reduces temperature by this influence on cardiac action; it also tends to inhibit respiratory action by its paralyzing influence upon the muscles of respiration. On general principles, aconitine tends to reduce functional action through its paralyzing influence upon nerve-centres.

Aconitine Poisoning.—The symptoms following a poisonous dose are those of aconite poisoning, but they occur more rapidly; hypodermically administered, aconitine may cause death in less than a minute. Tingling in the mouth and throat, numbness of the face and extremities, reduction of the cardiac pulsations, shallow breathing, dilatation of

the pupils, cold sweats, purging, etc., follow in quick succession, death coming on through paralysis of the heart.

Case of poisoning in which a stout German took eighteen tablets of aconitine, each containing $^1/_{260}$ grain, probably within half an hour's time. One hour and a half afterward there appeared symptoms of paraplegia; stertorous, irregular respirations, from six to thirteen times a minute; strangling; and tingling in the fauces. Pulse irregular, pupils slightly dilated and sluggish. Recovery under morphine hypodermically, emetics, whisky, and ammonia. Ferd. C. Valentine (N. Y. Med. Jour., Dec. 15, '88).

Treatment of Aconitine Poisoning.— The general indication is to prevent syncope. The recumbent position, warmth, and stimulants are pre-eminent among the measures to be employed. The stomach-tube may be used if the heart's action is not too weak, while the stimulation is procured by hypodermic injections of ether, ammonia, or whisky. Strychnia, digitalis, or caffeine are also valuable, but their action is not as rapid. They may be utilized to great advantage to sustain the heart's action, however, after the patient has shown evidences of reaction.

Case in which $^1/_5$ grain of crystallized aconitine was taken in mistake; the patient saved through energetic measures, combined with large doses of caffeine, subcutaneously, to sustain the heart. Veil (La France Méd., Sept. 29, '93).

Therapeutics.—Aconitine is possessed of no advantage that the preparations of aconite usually employed do not offer, and is much more likely to give rise to untoward results. It has been used with advantage in neuralgia and pneumonia, especially in the broncho-pneumonia following upon influenza. Erysipelas seems also to have been successfully treated with aconitine.

Treatment of erysipelas of the face by the use of nitrate of aconitine eminently successful in doses of $^1/_{640}$ grain every two hours, taking care not to exceed a daily dose of $^1/_{64}$ grain. Course greatly lessened and great relief from pain. Tison and Bourbon (London Med. Recorder, Jan., '91).

Spurious Preparations. — Aconitine has also been obtained from other varieties of aconite,—*Aconitum ferox* and *Aconitum Japonicum*,—but the properties of the preparations are still insufficiently known.

Aconitine obtained from *Aconitum napellus* possesses the same diaphoretic properties as pilocarpine. This effect is not obtained by the doses ordinarily employed. Aconitine from *Aconitum ferox* and *A. japonicum* has no such property. P. Aubert (Pharm. Centralhalle für Deutschland, No. 22, '94).

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Pseudaconitine, a highly poisonous constituent of the aconite found in Nepaul, probably *Aconitum ferox*. Small, colorless, transparent, dextrorotatory crystals, very slightly soluble in water, readily in alcohol, chloroform, and acetone. Persistent tingling sensation on the tongue; slightly more toxic than aconitine. W. R. Dunstan and Francis H. Carr (Journal of the Chem. Soc., p. 350, '97).

ACROMEGALY. — (Greek.) From ἄκρον, extremity, and μέγας, great.

Definition.—A non-congenital hypertrophy of the bones, especially the superior, inferior, and cephalic extremities. It was first described by Dr. Pierre Marie, of Paris, in 1885.

Symptoms.—In this disease there are two classes of symptoms:—

I. Constant or almost constant.

(*a*) Hypertrophy of the hands. This is often the first symptom noticed. They are spade-like,—namely, thick and wide, without notable increase in length.

The bones, muscles, cellulo-adipose tissue, and skin are all involved in the overgrowth. The skin is not œdem-

Typical hand in advanced acromegaly. (*Gastou and G. Brouardel.*)

atous, but is firm on pressure and somewhat darkened. The fingers are much enlarged, sausage-like, as thick at the distal as at the proximal extremities.

Sciagraph of the above hand, showing hyperostosis.

The interphalangeal furrows and the lines of the palms are exaggerated, while the thenar and hypothenar eminences are enlarged. The finger-nails seem short, widened, and are usually striated longitudinally. The fingers are rarely club-shaped.

The hypertrophy does not seem to affect the wrist to the same degree as it does the remainder of the forearm and hand. The arm and forearm, therefore, though they may be slightly enlarged, do not appear so. There is no interference with the function of the hands.

(*b*) Hypertrophy of the feet. This is

Case showing typical hypertrophy of the feet. (*Gifford.*)

of the same character as that of the hands. They are widened, thickened, but not lengthened, and the hypertrophy ceases or appears to cease at the ankles.

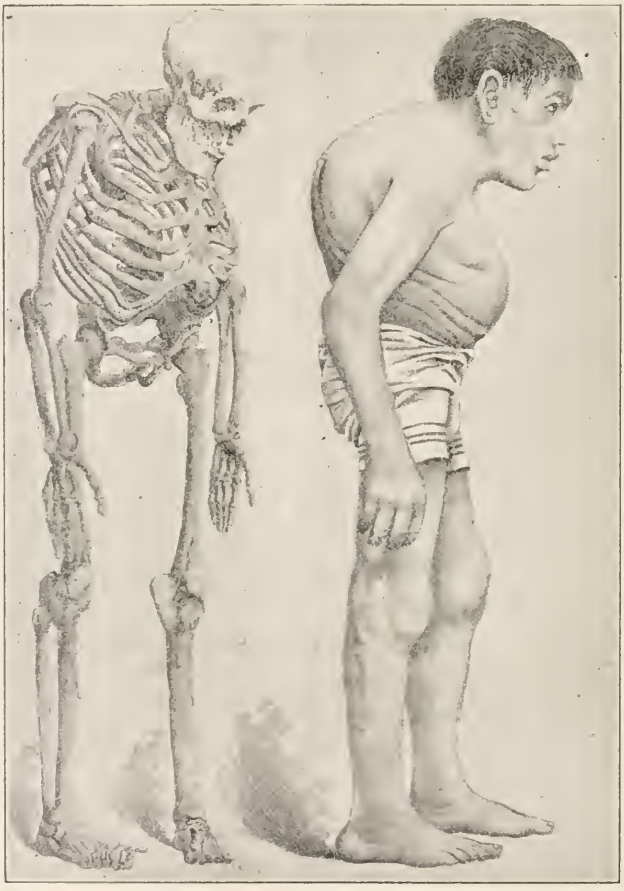
(*c*) Hypertrophy of the head. The skull is slightly increased in size, but the face is much more affected: it is lengthened; the eyes seem small compared to the size of the eyelids and orbital borders; the nose is enormous and flattened; the cheek-bones and chin project and the

lips are much thickened. The lower jaw-bone is especially affected. The tongue is increased in size and may even protrude from the mouth and greatly interfere with speech. The hard and soft palate, the uvula, the tonsils, the pillars, and even the teeth may be enlarged, causing cough and difficulty in speaking and eating.

Case with marked hypertrophy of the scalp. Hutchinson (Archives of Surg., Oct., '89).

Case in which trophic lesion was analogous to acromegaly; chief symptom was gradual, progressive enlargement of head and neck. Denomination of "megalocephaly" proposed. M. Allen Starr (Amer. Jour. Med. Sci., Dec., '94).

(*d*) Thorax. The vertebræ are especially affected, causing cervico-dorsal kyphosis, which may coincide with lumbar lordosis. The hypertrophy of the sternum, clavicles, ribs, costal cartilages, and scapulæ causes the chest to seem flattened from side to side and increased in depth from behind forward. The deformity of the chest may make respiration difficult and cause it to become abdominal in type.



Case showing characteristic alterations of the thorax. (*Fritsch, Klebs, and Brigidi.*)

Uncommon symptoms: long-continued abnormal rhythm in respiration of the Cheyne-Stokes variety, and inability to retain either food or drink in his stomach. Enlarged pituitary body found at the post-mortem. The gland weighed 475 grains, instead of 5 to 10 in the normal condition. J. R. Rathmell (Southern Practitioner, Dec., '95).

(*e*) Headache is often one of the first symptoms. It may be continuous or paroxysmal, diffuse, or, as is more frequent, localized in the occiput or nape of the neck.

Two cases, one of which had suffered temporarily from exceedingly acute cephalalgia. Kalindero (Rev. Inter. de Méd. et de Chir., Oct. 25, '94).

(*f*) Amenorrhœa resulting in sterility is one of the first symptoms in women.

In two women premature cessation of menses and hypertrophy of pituitary body. Ransom (Brit. Med. Jour., June 8, '95).

Case appearing at 47 years; amenorrhœa was only transitory, and menstruation was normal. Thomas (Revue Méd. de la Suisse Rom., June 20, '93).

II. Secondary symptoms:—

The neck is often short and thick. The thyroid gland may be normal, atrophied, or increased in size. The larynx is usually enlarged, causing in women a low voice and dyspnœa. The nasal cavities may also be compromised by enlargement of the turbinated bones, another source of dyspnœa being thus afforded.

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Case of acromegaly complaining of pain in the left side of the nose and slight difficulty in breathing. The inferior turbinated bodies were enormously enlarged; the other structures in the nasal cavity appeared normal. The anterior and posterior pillars, the soft palate, and the uvula were much thickened; also the tonsils and their capsules. The lingual glands were much hypertrophied. An external examination showed that the larynx was very much enlarged. The epiglottis was thickened. The arytenoid cartilages and the ventricular bands were enlarged. The glottis was very small. While the patient remained quiet, respiration was only slightly impaired, but excitement produced labored breathing and a crowing sound during both expiration and inspiration. During one of these attacks of dyspnœa the patient died. W. F. Chappel (Amer. Medico-Surg. Bull., Jan. 18, '96).

Case in which, besides other typical symptoms, the cartilages of the nose and ears were greatly thickened, and probably those of the larynx, as his voice had altered of late to a deep bass. The skin of the face was slightly pigmented; the orifices of sweat-glands enlarged. The tongue was enlarged enormously, the tonsils and uvula also. Difficulty in swallowing at times and slight asthmatic seizures. John N. d'Esterre (Brit. Med. Jour., Dec. 4, '97).

In women the mammæ are atrophied, the abdomen is enlarged and pendulous, and the pelvis and external genitalia enlarged and thickened. The uterus may be atrophied.

In man the penis, scrotum, and testicles may be enlarged or diminished. Sexual power and feeling may be abolished.

Case of acromegaly of fourteen years' standing in which, although the patient is 52 years old, there is no impediment of the sexual function. J. R. Rathmell (Southern Practitioner, Dec., '95).

The muscular system is usually atrophied, though it may be normal or hypertrophied. Electrical excitability is diminished (Erb) or increased (Verstraeten).

Case with amyotrophy, which appeared to be due to compression of the rachidian nerves. Duchesneau (Thèse de Lyon).

Some articulations (knee, wrist) have been found enlarged and giving creak-

ing sounds on movement, owing to relaxation of the ligaments.

Case in which there were, with great deformity of wrists, trophic lesions of the joints,—a certain amount of muscular atrophy similar to that occurring in the progressive atrophy of Duchenne. There were also a few symptoms of Raynaud's disease and a trace of albumin in the urine. Middleton (Glasgow Med. Jour., June, '94).

Case in which there was a cystic tumor in the popliteal space, communicating with the joint; in the latter were, besides synovial fluid, five small, solid masses. Roswell Park (Inter. Med. Mag., July, '95).

The knee-jerk is not increased; it may be normal, decreased, or absent. Cardiac hypertrophy with palpitation sometimes occurs. Arterial sclerosis and varicose veins have been noted. Hypertrophy of the lymphatic vessels and glands is not very infrequent.

Hunger and thirst are usually increased. Sometimes there is dyspepsia. Duchesneau records enteroptosis and nephroptosis.

Polyuria, glycosuria, peptonuria, and phosphaturia have been noted. Occasionally there is excessive sweating.

Case of acromegaly with Graves's disease and glycosuria. Lancereaux (La Sem. Méd., Feb. 16, '95).

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Case of acromegaly in which there were, besides sarcoma of the hypophysis cerebri, diabetes and struma. Hansermann (Berliner klin. Woch., May 17, '97).

Analgesia and anæsthesia of the skin have been reported and abdominal pain and great sensitiveness to cold. The skin is yellowish-brown and darkest at the extremities. It is dry and wrinkled. Warts are frequent. The hair is thick and abundant. The body-hair is thick and stiff.

Case with diminution of the sense of localization, the greater diameter of the tactile area being transverse. Bignami (Riforma Medica, Nov. 14, '90).

Taste, smell, and hearing may be affected; but, above all, vision. There may be amblyopia due to papillary congestion, irregular contraction of the field of vision, and Argyll Robertson's pupil. Especially interesting is temporal hemiopia caused by pressure from the enlarged pituitary body.

Thickening of eyelids, prominence of orbital ridges, exophthalmia, periorbital pains, hypersecretion of tears, nystagmus, etc., have been observed. Hertel (La Presse Méd., July 13, '95).

Case with binasal hemiopia due to compression of the optic chiasm by the hypertrophied pituitary gland. Bard (Lyon Méd., Apr. 17, '92).

Case with modification of the visual field and bitemporal hemianopia. Packard (Amer. Jour. Med. Sci., June, '92).

[Recently Dr. Packard's case died and there was found a much-enlarged pituitary body. C. W. Burr.]

Case with total atrophy of the left optic nerve and paralysis of the superior oblique muscle. Hare (Med. News, Feb. 27, '92).

Case in which there was rotatory nystagmus, bitemporal hemianopsia, and atrophy of the optic nerves. Reinhold Bolty (Deutsche med. Woch., July 7, '92).

Case beginning in the twenty-fifth year. Five years later there was atrophy of both discs with complete blindness in one eye and diminished vision in the other. The thyroid could not be felt. Dreschfeld (Brit. Med. Jour., Jan. 6, '94).

The following eye-symptoms have been noted by Maisonneuve: Exophthalmos; long, thick, bronzed upper eyelids; pupils reacting slowly to light, normally with accommodation. The movements of the eyes are slow, and, in raising them,

there is a want of synchronism with movements of the lids. There is retinal engorgement.

Case characterized by the early appearance of a central scotoma for colors, and, probably, also, hemianopsia for color, in which almost complete recovery of vision followed the use of iodide of potassium and the cessation of tobacco. Return of visual troubles (after more than two years) when the use of tobacco was resumed. Rapid deterioration of vision occurred when the thyroid tabloids were first used, but rapid and continued improvement followed the use of the fresh thyroid extract. Arthur Benson (Dublin Jour. Med. Sci., Nov., '95).

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Case in which the visual fields at no time showed any tendency toward the hemianopsic type which has so often been noted. This defect of vision is, in all probability, due, in most cases, to pressure exerted by the hypertrophied hypophysis cerebri. The claim that this pressure, as almost universally stated, is exerted upon the posterior border of the optic chiasm is certainly incorrect.

In spite of the gloomy prospect for good vision, which the case at one time presented, after more than a year the sight was $^{20}/_{30}$ with each eye, and it continues to be good. Current accounts would lead one to expect progressive, optic nerve-atrophy, ending in blindness, in all cases where serious disturbance of the sight has set in. H. Gifford (Western Med. Review, June 15, '97).

There is general muscular weakness, and the patients are melancholy and irritable. The intelligence remains unchanged in the majority of cases.

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Case of married woman, 68 years old, who first manifested signs of mental defect at age of 50 and was taken to hospital for insane because of homicidal tendencies. Meanwhile the extremities became much enlarged, fingers sausage-shaped, features thickened, bones of chest thickened and enlarged, thyroid small, and thymus not discernible. Henry Waldo Coe (Jour. Amer. Med. Assoc., Dec. 3, '98).

Diagnosis.—Myxœdema.—In this disease there is simple œdematous infiltration of the soft parts, and a round, swelled face instead of the irregular face observed in acromegaly.

Osteitis Deformans.—In osteitis deformans the face is triangular with the base upward; in acromegaly it is ovoid or egg-shaped, with the large end downward; in myxœdema it is round and full-moon shaped. (P. Marie, Osler.)

Leontiasis Ossea.—In this disease there is hyperostosis of the bones of the face and skull. The hyperostoses of the bones of these regions form boss-like masses; the hands and feet are normal.

Elephantiasis.—The elephantiasic thickening is limited to the skin and is unilateral.

Chronic Rheumatism.—In rheumatism there are characteristic deformities of the hands and feet, articular pains, muscular atrophy, and early impotence.

Rachitism and Lymphatism United.—Special deformities, absence of enlargement of lower jaw, and macroglossia.

Erythromelalgia.—Here the soft parts of the hands and feet are red, the face is unaffected, and there is no involvement of the bones.

Gigantism.—In true gigantism the body grows symmetrically. In acromegaly the abnormal development is promiscuously localized. Gigantism and acromegaly may, however, be present in the same case.

Case associated with giant-growth. Acromegaly is giant-growth in the adult, while giant-growth is acromegaly of adolescence. Brissaud and Meige (Jour. de Méd. et de Chir. Prat., Jan. 25, '95).

Autopsy of a giantess. Main points:

hypertrophy of pituitary body and enormous pituitary fossa. Hutchinson (Amer. Jour. Med. Sci., Aug., '95).

Case of an Indian, exhibited as a giant, who had, in addition to symptoms of acromegaly, facial hemihypertrophy. At the autopsy the pituitary gland was found to be much hypertrophied.

Case of another professional giant seven feet and five inches tall, who had only some symptoms of the disease. Acromegaly is sometimes associated with giant-growth. Dana (N. Y. Med. Jour., Aug. 12, '93).

Acromegaly may be regarded as a partial giant-growth, but it differs very essentially from the latter. In gigantism the length of the body is over six times the length of the foot; in acromegaly it is under six times the length of the foot. Virchow (Berliner klin. Woch., Feb. 4, '89).

Case in a man, six feet and seven inches in height. Another case cited, height seven feet and four inches, in which there was hemihypertrophy of the face, on the left side. This is a rare combination, being only the eleventh known. Dana (Jour. of Nervous and Mental Dis., Nov., '93).

Case of acromegaly in a giantess. Byrom Bramwell (Edinburgh Med. Jour., Jan., '94).

Autopsy on a giant from Egypt, showing exostoses and diffuse porous osteoperiostitis. Sirena (La Méd. Mod., July 18, '94).

Autopsy on a German giant who had not begun to grow abnormally before the age of 36 years. Fritsch and Klebs (Corres. f. Schweizer Aerzte, p. 662, '93).

[In both cases there was acquired gigantism, which is the most common form. It would seem that gigantism, as well as dwarfism, arises from a disease occasioning disturbances of growth, and that, owing to the osseous lesions frequently present, there is a certain analogy with acromegaly. Unilateral hypertrophy of the face is of rare occurrence. P. Sollier, Assoc. Ed., Annual, '95.]

Pulmonary Osteoarthropathy.—In this disease there is hypertrophy with deformities, but of the osseous system only; no amenorrhœa nor enlargement of lower jaw. The third phalanx of the fingers is much enlarged, like a drumstick, the nails are lengthened, widened, striated longitudinally, curved over the finger-tip. The carpus and metacarpus are almost normal, while the wrist is enlarged and deformed. The same lesions occur at the feet, and the lower portion of the leg may be larger around than the calf. The long bones, especially of the leg and forearm, are enlarged. The joints are swelled and move with difficulty. Kyphosis exists, when present, only in the lower dorsal or lumbar region. The face is normal, except that the upper jaw-bone may be enlarged. Some chronic thoracic lesion is present. (Marie.)

Case presenting certain features like those occurring in hypertrophic pneumic osteoarthropathy. Lavielle (Jour. de Méd. de Bordeaux, Jan. 7, '94).

It is doubtful where acromegaly can be separated from pulmonary osteoarthropathy. (Arnold.)

Pseudoacromegalic Syringomyelia.—Affects usually the lower limbs only,—one only sometimes, and may not affect all the fingers. Deformities and trophic changes are present. Scoliosis and dissociation of sensibility are notable features.

Case of hereditary syphilis presenting great length of diaphysis of long bones, wrist, and elbow. Nobl (Le Bull. Méd., Aug., '95).

Etiology.—The disease usually begins between the ages of 20 and 40 years. It is more common in women than in men, and no influence can apparently be attributed to race, heredity, or antecedents.

Case following excessive weakness due to parturition. Middleton (Glasgow Med. Jour., Aug., '95).

Case suggesting influence of trauma-

tism upon development of acromegaly and diabetes. Marinesco (Le Bull. Méd., June 26, '95).

Cases of acromegaly in father and son. In the latter a tumor of the pituitary body was found at the autopsy, together with generalized endarteritis and sclerotic atrophy of the thyroid gland. Bonardi (Revue des Sci. Méd. en France et à l'Etranger, Jan. 16, '94).

Case in a young negro aged 10 years. Beavan Rake (Brit. Med. Jour., Mar. 11, '93).

Case in a woman aged 63 years. Ganse (Deutsche med. Woch., Oct. 6, '92).

Pathology.—The skull may show disappearance of sutures, hypertrophy of the external occipital protuberance, deformity of the condyles, thickening of the frontal and occipital bones, and increase in size of the processes inside the skull and, above all, of the pituitary fossa. Both maxillaries are enlarged, the lower especially so; the alveolar processes and zygomatic arch are also increased in size.

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Sciagraph from a case of Dr. Sanger Brown's. The skin outlines are entirely lost; pointed chin shows striking prognathous type. The light area above the upper teeth is the antrum, distinctly bordered by an upper, bony plate. The outlines of the orbit are not shown. In normal cases the orbital arch shows itself almost as this region appears when a skull is viewed laterally. The frontal eminences protrude strongly. The light, semilunar area is not the frontal sinus, which often shows in sciagraphs, but is probably due to a more membranous bony formation than the outside layers. O. L. Schmidt (Medicine, July, '97).

In the vertebral column the hypertrophy especially affects the extremities of the cervico-dorsal spinous processes. The hypertrophy especially affects the bones of the extremities and the extremities of the bones (Marie).

There is dilatation of the air-sinuses of the skull, and changes in the temporo-maxillary articulation, permitting forward dislocation of the lower jaw. There is a tendency to formation of new bone, both in normal and abnormal situations. Thompson (Jour. of Anat. and Phys., July, '90).

The most characteristic lesion is a symmetrical thickening, which increases toward the projections. Arnold (Beiträge z. path. Anat. u. z. Allge. Path., B. 10, No. 1).

Histologically the growth consists in

Sciagraph of skull in acromegaly. (*Schmidt.*)

an hypertrophy of the medullary bone, while the periosteal bone is reduced to a thin layer. This attacks red marrow-bones especially. Duchesneau (Thèse de Lyon, '91).

Case of a young man who entered the hospital for a tumor of the right thigh, requiring amputation of the limb. The tumor was a malignant osteoid growth of J. Müller or chondrosarcoma of Virchow. The patient had recovered from the operation, which had been performed in December, 1894, when thoracic disturbances and symptoms of acromegaly developed progressively. Death occurred toward the end of September, 1895. The lungs and pleuræ contained enormous

enchondromatous tumors, as large as a child's head in some cases; microscopically they were found to be everywhere composed of cartilage-tissue at every period of development.

The pathological lesions of acromegaly existed in the limbs; the hyperplasia of the periosteum, instead of being limited to the extremities of the phalanges, extended the entire length of the limbs to the hips. The shafts of the femur and humerus were surrounded throughout their entire length by osteophytes; on the ulna and radius some of the osteophytes could still be compressed by the finger. The epiphyses were normal, but were, from the youth of the patient, not yet connected to the shaft. The condition of the pituitary body was not given in the autopsy. In its neighborhood, at the spheno-occipital synchondrosis, a myxomatous enchondrosis was found. R. Virchow (Berlin. klin. Woch., Dec. 16, '95).

Hyperplasia of the connective tissue and adipose tissue of the periosteum is present, while its inner layer gives rise to osseous neoformation.

There is central absorption due to osteoblasts, with intense peripheral histogenesis, in the periosteum and articular cartilage. (Marie and Marinesco.)

The lesion most frequently observed, and apparently the main feature of the disease, is one of the pituitary body. This organ may undergo various pathological changes, ranging from hypertrophy to the more malignant forms of neoplasm, such as sarcoma.

Of 19 published cases there was hypertrophy of hypophysis in 3, hypertrophy with increase of connective tissue in 1, sarcoma in 3, adenoma in 2, softened adenoma in 1, tumor with little cavities lined with epithelium in 1, glioma in 1, tumor with character not specified in 3, vascular hypertrophy in 1, colloid degeneration in 1, sclerosis and atrophy in 1, and necrosis with softening in 1. Sternberg (Zeit. f. klin. Med., vol. xxvii, p. 86, '95).

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Enough cases have been reported to refute the hypothesis that the enlargement of the hypophysis cerebri in acromegaly is, like the other hypertrophies, merely a symptom of the disease. If simple hypertrophy were the constant lesion, it might be claimed that it was a result and not a cause of the disease, but it hardly needs argument to show the improbability that any one disease would cause, in a single organ, so many and various morbid conditions as are enumerated in Sternberg's list. W. L. Worcester (Boston Med. and Surg. Jour., Apr. 23, '96).

Analysis of thirty-four recorded necropsies on cases of acromegaly. Changes in the pituitary gland found in all. In all but three there had been either hypertrophy or tumor. Percy Furnivall (Lancet, Nov. 6, '97).

Of 97 reported cases of acromegaly, autopsy had in 15 cases: 12 showed changes in the hypophysis cerebri. There is a connection between the changes in the pituitary body and acromegaly. Personal view that all organs have a double function: a negative, withdrawing something from the organism; and a positive, introducing something into the organism. The progressive development of one organ has progressive development of other organs as a consequence. Hansermann (Berliner klin. Woch., May 17, '97).

Case of acromegaly in which death occurred in an accident. At necropsy the skull was found uniformly thickened and heavy, and all the air-spaces were dilated. The sella Turcica was deep and wide, and the pituitary body was converted into a cyst containing semifluid substance. Percy Furnivall (Lancet, Nov. 6, '97).

The pituitary body is sometimes enlarged from the size of a pigeon's egg to that of a hen's egg; it dilates the pituitary fossa and clinoid processes, and is lodged in a considerable depression in the base of the brain.

Case in a woman, 35 years old, in whom symptoms of confirmed acrome-

galy had been present for three years. In May, 1893, there were visual disturbances, and double optic neuritis was found to be present. In July, 1895, there were noted: complete blindness of the right eye, continuous headache, and pain in the limbs; the patient became somnolent and died in a comatose condition.

Autopsy showed the thymus to be abnormally voluminous and the thyroid gland normal. Some signs of adhesive meningitis were present at the vertex. The pituitary body was enlarged, softened, and vascular. The dura mater of the sella Turcica had disappeared, and the bone had been worn away in that region. The hypertrophy of the pituitary body had compressed the two optic tracts and the chiasm, the right optic tract being partly destroyed and the left optic tract completely so. No other lesion was found. The pituitary body showed, microscopically, the appearance of a gliosarcoma. Roxburgh and A. Collis (Brit. Med. Jour., July 11, '89).

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Case of acromegaly with post-mortem, at which the thymus was found replaced by a mass of fibrous fat and lymphoid tissue. The thyroid was enlarged symmetrically and filled with small cysts. The gland-substance was normal under the microscope, but there was increase in the interstitial tissue. Pituitary body was enlarged and a portion of it presented consistence and microscopical appearance of an adenoid tumor. Pearce Bailey (Phila. Med. Jour., Apr. 30, '98).

Cases have been reported, however, in which, although typical symptoms of the disease were present, no disease of the pituitary body could be detected.

Case with numerous cystic cavities in the brain, but with a normal pituitary body. Waldo (Brit. Med. Jour., Mar. 22, '90).

Case in a man, aged 74 years, in whom there was no tumor of the hypophysis, but endarteritis with atrophy and sclerosis of the thyroid body. Bonardi (Riforma Medica, Aug. 24, '93).

Again, hypertrophy of the pituitary gland may not give rise to the manifestations of the disease.

Case in which hypertrophy of the pituitary gland had caused no phenomenon of acromegaly. Packard (Amer. Jour. Med. Sciences, June, '92).

The pressure of the growths of the pituitary body on the optic tracts gives rise to the ocular disturbances enumerated.

Literature of '96-'97-'98.

Case in which the pituitary body, which was the size of a walnut, was very soft and vascular. The mass had so pressed upon both optic tracts and the chiasm as to cause total disappearance of the left tract and partial destruction of the right. On the left side of the mass there was a blood-clot the size of a large pea. Roxburgh and Collis (Brit. Med. Jour., July 11, '96).

The hypophysis cerebri generally lies wholly or partly in front of, not behind, the chiasm, and its anterior part is so much nearer the optic nerves than its posterior part is to the chiasm (on account of the nerves, chiasm, and tracts slanting upward posteriorly) that with a uniform enlargement of the gland the nerves in front of the chiasm would almost always be pressed upon sooner than the chiasm itself. Zander (Deutsche med. Woch., vol. iii, p. 13, '97).

The nervous symptoms sometimes observed may also find in the pressure upon the surrounding cerebral tissues one of their causes.

Literature of '96-'97-'98.

Case of acromegaly of many years' standing in a man aged 54, who, in the last three years, had developed Jacksonian epilepsy limited to the right upper extremity and right side of the face. Hypertrophy of the pituitary gland constitutes a cerebral tumor capable of exciting from a distance the cortical psychomotor centres. Raymond and Souques (Centralb. f. Nerv., No. 82, '96).

The viscera may take part in the hypertrophic process. The liver frequently shows fatty degeneration.

Literature of '96-'97-'98.

Case of acromegaly in which the heart was enormously enlarged, weighing two pounds and nine ounces,—one of the largest hearts on record. O. T. Osborne (Med. News, May 22, '97).

Case of a man, 23 years of age, who was quite well until 1893, when he had an attack of typhoid fever, after which typical acromegaly developed, including pigmentation, except that there was no great enlargement of the lower jaw. He died, soon after admission, of diabetic coma. Necropsy showed, in addition to the usual external signs of acromegaly, a general enlargement of the viscera. Liver weighed 90 ounces, the spleen 9¾ ounces, the heart 13, and the kidney 9. The pituitary body was so enlarged as to distend the sella Turcica, and contained several drops of a fluid resembling pus. It did not appear to have compressed the commissure, and there was no optic atrophy. Norman Dalton (Lancet, May 22, '97).

The pigmentation noticed in the above case might have been due to the condition of the thyroid, the association of acromegaly with exophthalmic goitre being a recognized one; the disease had obscure relations with myxœdema, and had been successsfully treated by means of thyroid extract, although the work of Schäfer and Oliver had shown that extracts of thyroid and of pituitary body were antagonistic in action. H. D. Rolleston (Brit. Med. Jour., May 22, '97).

The skin of the extremities shows hyperplasia of the papillæ, and hypertrophy of the derma, all the connective-tissue system being enlarged, that of sweat-glands, sebaceous glands, hair-follicles, external and internal vascular walls, and, above all, the lamellated sheath of the infradermic nerves are likewise degenerated.

There is marked sclerosis of the great sympathetic system, especially the lower cervical ganglion. The neuroglia in the brain is hyperplastic.

Autopsy showing following conditions: The lymphatic ganglia of the neck profoundly altered, containing no more lymph-follicles; all varieties of white globules present, with single nucleus, with polymorphous nucleus, and with multiple nuclei. The striated muscular tissue of the neck showed atrophy and sclerosis, the nuclei had budded abundantly, and the sarcoplasma had undergone vacuolar and granular fatty degeneration. The hypertrophied pituitary gland was undergoing process of necrosis, and liquefaction of its constituent parts had taken place; the portions escaping this destruction consisted of lymphoid tissue similar to that of the lymphoid ganglia of the neck. The thyroid gland was affected both by atrophy and glandular hypertrophy, as well as by hypertrophy of the connective tissue and lymphoid infiltration.

The liver showed fatty degeneration and glandular atrophy, with slight lymphoid infiltration of the interlobular connective tissue. There was chronic interstitial and parenchymatous inflammation of the kidneys, hyperplasia of the splenic pulp and of the Malpighian follicles. The tongue was increased in size from hyperplasia of its connective tissue. Claus and Van der Stricht (Annales de la Soc. de Méd. de Gand, No. 71, '93).

The blood does not show evidence of great alteration.

In one case the amount of hæmoglobin was 95 per cent. of the normal; the average of ninety-six countings showed 7,000,000 red corpuscles to the cubic millimetre. The proportion of white to red corpuscles was about 1 to 400. Church and Hessert (Med. Record, May 6, '93).

The kidneys show chronic parenchymatous nephritis in the cortical substance, moderate sclerosis of interstitial tissue, and peripheral infarcts.

In the thyroid gland the follicles are either found hyperplastic or cystic, and contain hæmoglobin crystals. This organ is generally hypertrophied. The thymus is occasionally found to have persisted.

Typical case, which appeared to date from an old cerebral affection, in which hypertrophy of the thyroid gland was also observed. Bruzzi (Gaz. degli Osp., Aug. 4, '92).

Case showing a large glioma of the hypophysis, and each lobe of the thyroid enlarged and containing a cyst. Bury (Med. Chron., July, '91).

Case of diabetic acromegaly, with thick and heavy skull, and an occipito-frontal diameter of sixty-six centimetres. The pituitary body was softened and voluminous; the thymus had persisted, and the thyroid body was cretaceous. Lathuray (Lyon Méd., July 11, '93).

Case with hypertrophy of the pituitary body and persistence of the thymus; the thyroid gland was enlarged and weighed nearly two ounces. T. Coke Squance (Brit. Med. Jour., Nov. 4, '93).

Literature of '96-'97-'98.

The thyroid gland was examined in 24 cases; it was normal in only 5 and hypertrophied in more than half. The thymus was examined in 17 cases; it was absent in 7, hypertrophied in 3, and persistent in 7. The sympathetic ganglia were examined in 10 cases and reported as hypertrophied in 6. The only constant associated changes appeared to be those in the pituitary body; these changes were not uniform and might occur without acromegaly. Percy Furnivall (Lancet, Nov. 6, '97).

The spleen and the lymphatic glands are generally sclerosed.

Among the various theories as to pathogenesis of acromegaly the following are the most prominent:—

Acromegaly is due to an unusual development of the vascular system; it is a thymic angiomatosis. The endothelial elements originating in the thymus play the part of vasoformator cells, causing an increase in the vessels, and hypernutrition and increase in growth of the extremities where the blood-current is the slowest. (Klebs.)

Case in which there was hypertrophy of the pituitary body compressing the optic nerves, persistence of the thymus, and hypertrophy of the great sympathetic. Cepeda (Revista Balear de Ciencias Medicas, Jan. 15, '92).

Case in which the tumor of the pituitary body was a typical spindle-celled neurosarcoma.

The thymus was of considerable size, but without any change in its elements; the thyroid gland was enlarged and filled with small cysts containing colloid matter. Mossé and Daunic (Soc. Anat., Paris, p. 633, Oct. 25, '95).

It is due to disturbances in the evolution of the genital life. (Freund, Verstraeten.)

A trophoneurotic affection, due to changes in the central and peripheral nervous system, causing hypertrophy of the extremities by means of the vasomotor system. (Recklinghausen and Holschewnikow.)

A systematic dystrophy, something like myxœdema, and connected with some organ (pituitary body?) much as myxœdema is in connection with removal or alteration of the thyroid gland. (P. Marie.)

The pituitary body has been destroyed in animals without causing acromegaly. (Marinesco, Vassale, Sacchi.)

Disease partly caused by changes of pituitary body. At first hypertrophy of gland with exaggeration of functions; later on, abolition of functions. Tamburini (Dublin Jour. Med. Sci., Aug., '95).

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The cases described by Hagner, Fraentzel, and Gombault-Marie must be

considered as a form standing between acromegaly and osteoarthropathy. The disease begins in youth, without being preceded by any affection of the lungs; the bones of the face and the cartilages are affected, and the pathological changes are more like those of acromegaly than of osteoarthropathy. F. R. Walters (Progrès Méd., No. 3, '96).

Three cases of acromegaly, in the first of which diabetes, gigantism, and splanchnomegaly were present; in the second arteriosclerosis, and in the third dyspepsia and a lesion of the pituitary body (sarcoma, cysts); but other quite different changes were likewise visible, —namely, degeneration of the thyroid gland, periependymatous gliomatosis, and cancer of the viscera.

When the embryological and anatomical relations of the ependyma and pituitary body are considered, it may be asked whether they do not, as a whole, form an anatomical and physiological system governing the processes of nutrition and capable, when diseased, of giving rise to the dystrophic changes of acromegaly. Dallemagne (Arch. de Méd. Exp., No. 7, '96).

Prognosis.—Progressive, slow, and interrupted advance of the disease, lasting from twenty to thirty years, and ending in death either by cachexia, by some complication, or, very rarely, by sudden syncope represent, in brief, the course of the vast majority of cases.

Treatment.—At present it can be only symptomatic. The extracts of thyroid gland and pituitary body will probably prove useless as curative agents. Pain and insomnia are relieved by antipyrine, sulphonal, etc. Arsenic has proved useful in some cases. Iron in large doses and hydrotherapy have done some good in one case in the hands of Brissaud, and ergot in those of Schwartz.

Case of acromegaly treated with desiccated thyroid gland with good results. Solomon Solis-Cohen (Med. and Surg. Reporter, May 26, '94).

Case treated by extract of pituitary; no appreciable result. Analogy between myxœdema and acromegaly suggesting the thyroid gland; rapid improvement. Caton (Brit. Med. Jour., Feb., '95).

Acromegalic patient suffering from paralysis of right oculomotor nerve, gray atrophy of discs, and hemianopsia. Improvement after mercurial inunction. Schlesinger (La Sem. Méd., Jan. 30, '95).

Case of classical acromegaly treated with tablets of thyroid-gland extract. The patient was given first 2 tablets, then 3, and finally 4 tablets daily. The general nervous condition was improved, the pain and paræsthesia of the fingers diminished, and the fingers themselves were more easily moved. A general loss in weight became manifest and the patient became visibly weaker, while the frequency of the heart's beat constantly increased and considerable chlorosis was present. Cessation of the tablets, administration of iron, and rest in bed caused such improvement in the patient that it became possible to begin again the administration of two tablets. Notwithstanding this experience, the author recommends the treatment of acromegaly with thyroid-gland extract. L. Bruns (Neurol. Central., No. 24, '95).

Three cases of true acromegaly treated with tabloids of the pituitary body of sheep. In the first case the headache, which was, at times, exceedingly violent, diminished, and recurrence of the headache coincided always with momentary cessation of the treatment; in the second case the headache, pains in the limbs, and paræsthesia of the hands diminished, and the tumefaction of the soft tissues was less. In the third case, a diabetic patient, no results were obtained. Marinesco (Soc. Méd. des Hôp., Nov. 8, '95).

Case of acromegaly in a woman, 25 years old, treated for several months without success with tabloids of thyroid gland; after taking for fifteen days 2 grammes daily of pituitary body of ox, in capsules and without disturbance, improvement was noted. The jaws, which could not be shut because the lower one extended seven millimetres beyond the upper one, could be brought nearer together, and the knee-jerk, which was

missing, returned on the left side. E. Mendel (Berliner klin Woch., Dec. 9 and 30, '95).

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Case of a woman, aged 34 years, who suffered from acromegaly, the first symptoms of which had appeared at the beginning of 1894. In February, 1896, she was given daily, for a month, tabloids of extract of pituitary body (15 grammes daily). The pains in the head and limbs, which were intense before the treatment, diminished, as well as glycosuria, which was present. No alteration in the size of the affected parts occurred. Rolleston (Lancet, p. 1137, Apr. 25, '96).

Case markedly benefited by treatment with animal extracts. During the first two months she took ½ grain of thyroid extract three times a day. One grain of this extract represents 10 grains of the fresh gland. During the third and fourth months desiccated pituitary bodies were given, about 1½ grains three times a day. During the last month a combination of both extracts was administered, 4 grains of desiccated pituitary bodies and ½ grain of thyroid extract a day. H. H. Dinke (Med. Record, Nov. 28, '96). (See also article on Animal Extracts.)

De Cyon mentions a case of a child, 12 years of age, who suffered from acromegaly. Under influence of treatment by hypophysin continued during six or seven weeks the condition of the patient was much ameliorated; weight fell from 121 ½ to 101 ¼ pounds, and circumference of abdomen from 44 ½ to 31 inches. Headaches had diminished in intensity and in duration, pulse had become regular, and intelligence began to awaken. Lancereaux (La Sem. Méd., Nov. 23, '98).

Charles W. Burr,
Philadelphia.

ACTINOMYCOSIS.—Gr., ἀκτῖς, a ray; μύκης, fungus.

Definition. — A parasitic, infectious, and inoculable disease due to the development of the actinomyces, or ray-fungus. First described in 1877 in cattle by Böllinger and in man by James Israel; it can no longer be considered a rare disease. From its frequent development in the lungs it has often been confused with tuberculosis.

Symptoms.—The symptoms vary according to the locality of the disease. The affection is chronic and exceptionally rapid. The granulation tissue is abundant and the mass resembles a tumor. Previous to suppuration it is quite firm, and, if progressing rapidly, is surrounded by diffuse œdema. Pain and tenderness hardly ever exist. When suppuration occurs the mass increases rapidly in size.

Literature of '96-'97-'98.

Total of 500 cases from literature showing that the various regions of the body are proportionately the site of the disease, as follows: Head and neck, 55 per cent.; thorax and lungs, 20 per cent.; abdomen, 20 per cent.; other parts, 5 per cent. In France the face and neck were affected in 85 per cent. of the 66 cases reported. Poncet and Bérard (Le Bull. Méd., Aug. 8, '97).

1. Cutaneous Surface.—Usually, a lesion of the skin is secondary to the evolution of an underlying actinomycotic tumor, which, by its growth, bursts through the skin. A sanguineous or purulent liquid, containing the characteristic grains, issues from the ulcerations so formed. The grains are small, opaque, yellowish-white, or yellowish masses about as large as a pin-head, which are composed of smaller grains, measuring about one-tenth of a millimetre. These smaller grains are formed by a central mass, of interwoven or straight fibres, whence extend toward the periphery spoke-like prolongations, with club-like terminations. Rarely the affection may develop primarily on the fingers, hand, nose, or face. It forms a

small, round, ligneous mass, which may soften in a few weeks, burst through the skin, and give a granulous and varied pus, containing actinomycotic granulations. The border of the granulation is uneven, violet-hued, and undermined. Around the original mass there arise secondary masses; so that the entire lesion forms a violet-red, indurated patch, deeply adherent, and somewhat resembling scrofuloderma.

In cutaneous actinomycosis the lymphatic ganglia are usually not enlarged. Pain is, in some cases, intense; in other cases it is awakened only by pressure.

> Pathognomonic spots, which are more or less deep in color according as the general color of the lesion is more or less pronounced. If the general color is pale, the spots are blush-red or violet; if the tint of the mass is deeper the spots present a blackish or slate color. These spots vary in size from that of a pea to that of a pin's head. They appear to correspond to the points at which the wall of the abscess is thinnest, and it is here alone that fistulæ form. Derville (Jour. des Sci. Méd., de Lille, Aug. 31, '95).

> Cutaneous actinomycosis is less debilitating than actinomycosis of the viscera; but it has a bad effect, either directly or indirectly, upon the whole economy. In all cases a few painless and distinctly enlarged lymphatic glands have been found. The adenitis, at times, is bilateral. F. Monestié (Jour des Sci. Méd., de Lille, Aug. 31, '95).

> Case of actinomycosis extensively involving the skin in a boy, aged 13, whose family lived over a stable-yard, and who suffered from an apparently simple attack of serous pleurisy, from which he recovered with marked retraction of the affected side. Shortly afterward he was readmitted to a surgical ward on account of abscesses over the front of the chest and right hip, which were regarded as tuberculous, and scraped. He returned to the hospital seven months later with a very extensive tract of disease implicating the skin, chiefly on the back, the most important feature being large sarcomatous-looking growths, ulcerating at various points, situated upon hard, brawny, and deeply-undermined skin. From the ulcerative points pus exuded, mixed with characteristic yellow granules, readily recognized, microscopically, as actinomycosis. Treatment by iodide of potassium and thyroid tabloids appeared to be attended with benefit. (*See colored plate.*) J. J. Pringle (Trans. of the Royal Medico-Chir. Soc., '95).

2. Alimentary Canal.—*Teeth.*—The fungus has been found in carious teeth (Israel), often side by side with leptothrix (Senn), or almost pure culture with no manifestation of disease except chronic periodontitis (Partsch).

Tongue.—In man three cases of this affection have been found on the tongue, one of which was of primary development; the other two are believed to have found origin in a carious tooth.

> Case of actinomycosis of the pharynx in a girl aged 15 years. The tonsils showed white projections resembling masses of moss, which seemed to grow in the crypt:. The pharyngeal wall also showed these white masses. The diagnosis was established microscopically. G. Didsbury (Revue de Laryn., d'Otol., et de Rhin., Oct. 15, '95).

Lingual actinomycosis in cattle appears as a nodular tumor, with prolongations into the parenchyma, of ligneous hardness.

Jaws.—The lower jaw is the most frequently affected. At first the disease resembles periosteal sarcoma, until the loose tissues of the neck are reached, when it often rapidly extends downward along the subcutaneous connective tissues and intermuscular septa. (Senn.)

The upper jaw is rarely primarily affected. It then tends to attack rapidly the adjacent parts, and even the base of the skull and brain.

Case of Actinomycosis extensively involving the Skin. (Pringle)

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Actinomycosis may attack any part of the body, but it is most frequently located in the cervico-facial region, especially the angle of the inferior maxilla. In this location it may present itself in two forms: acute, the symptoms being those of a septic phlegmon; subacute, in which there is early and continuous trismus, softening, and œdema. Poncet (Archives Prov. de Chir., Mar. 1, '96).

Nine cases of actinomycosis in man, of which 1 was fatal. Upper jaw was seat of disease in 1 case, lower jaw in 5, neck in 1, and abdomen in 2. In all facial cases dental caries was present. Contracture of masseters occurred in 3 cases. Pain was not constant nor marked symptom. Fever slight or even absent. In one case actinomycetes could not be found until after three months, although repeatedly looked for. Actinomycosis in man is not so rare as is commonly supposed, 39 cases having been published in Italy since 1882, not counting the 9 above. Fantino (Rif. Med., Apr. 20, 21, 22, '98).

3. Intestinal Canal.—The disease begins with a sharp lancinating pain in the abdomen and follows the course of chronic peritonitis. Swellings forming abscesses are found on the anterior abdominal wall which sometimes communicate with the intestine. It may also start from the vermiform appendix. There have also been cases of primary actinomycosis of the colon with metastatic deposits in the liver.

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Case in a man, 21 years of age, who passed through a febrile disease of several weeks. Shortly afterward a swelling formed below the crest of the ilium, which disappeared spontaneously, but eventually returned. The whole iliac fossa showed a hard, dense infiltration. Free incision proved the disease at once to be actinomycosis. At the bottom of the very large wound lay the perforated appendix. Later on the ascending colon became involved. Ascending colon resected and the appendix extirpated. F. Lange (Annals of Surg., Sept., '96).

4. Genito-Urinary Tract. — The uterus may also become invaded by the disease, the first manifestation being the discharge of a turbid fœtid fluid containing the characteristic shreds and masses.

Case of actinomycosis of the uterus in a woman 64 years of age. For four years she had noticed a discharge from the vulva, usually consisting of blood, but sometimes yellowish and fœtid. The uterus was prolapsed. General health good. The uterus found slightly enlarged, with gaping os. A drop of the fœtid yellow liquid was found at the os. Under the microscope these shreds showed the characteristic appearances of actinomycosis. Vaginal hysterectomy. Recovery. Davide Giordano (La Clinica Chir., June, '95).

5. Bronchial Tubes and Lungs.—In bronchitic actinomycosis the affection is less severe in winter than in summer, which is the contrary of what is observed in ordinary bronchitis. It can be classified in three groups: (1) lesions of chronic bronchitis, (2) miliary actinomycosis, and (3) cases with broncho-pneumonia and abscesses. The lower lobe is attacked more frequently than the upper; the opposite is the case in tuberculosis.

6. Brain.—Here, tumor-like symptoms exist during life, with headache, paralysis of the abducens, congestion of the optic papilla, and attacks of unconsciousness.

Literature of '96-'97-'98.

Case of actinomycosis of the temporo-maxillary region in a man of 25 years, in which the first symptom was trismus, which gradually increased in intensity. E. Briau (Lyon Méd., Jan. 24, '97).

Necropsy indicating the probable mode of infection of the orbit and brain.

Sinus found leading from the orbit to the gum of the upper jaw; the ray-fungus had probably lodged in or near a tooth, as it has so often been found to do. The fungus was probably carried into the system on an ear of corn chewed at harvest-time. Having reached the orbit, it crept along its outer wall and in the wall of the right cavernous sinus to the base of the brain, ultimately setting up meningitis and small abscesses, and burrowing through the pituitary body and sella Turcica to the cavernous sinus of the left side. In all probability the disease had reached the cranial cavity before admission into the hospital. W. B. Ramson (Brit. Med. Jour., June 27, '96).

Cerebral complications and death in a case of cervico-facial actinomycosis in a man aged 61. At first localized in the region of the left inferior maxilla, where it was mistaken for periostitis from dental caries, it invaded later the upper part of the neck and the temporal region. Here it caused a subperiosteal abscess, which, spreading to the sphenomaxillary fossa and the back of the orbit, finally infected the meninges through the sphenoidal fissure. A secondary infection by a slender bacillus produced an abscess in the left temporal lobe containing fœtid pus. This abscess burst into the lateral ventricle, which was considerably dilated, and produced coma and death about seven months and a half after the appearance of the first symptoms. Bourquin and de Quervain (Rev. Méd. de la Suisse Rom., Mar. 20, '97).

Diagnosis.—When the process is very rapid, actinomycosis may stimulate acute phlegmonous inflammation and osteomyelitis; or, when wide-spread, syphilis.

Sarcoma.—This form of neoplasm does not suppurate or break down so early.

In the jaws it is to be differentiated from dental affections: epulis.

Tuberculosis.—In this disease the lymphatic glands are infected, and the apices are usually the first involved.

Carcinoma.—The skin or mucous membrane involved is in close connection with the tumor; in actinomycosis the skin will be found broken on microscopical examination.

Syphilis.—A gumma will, in two or three weeks, be sensibly affected by large doses of potassium iodide, which does not act so rapidly in actinomycosis.

The undoubted influence exercised by iodide of potassium countenances the suspicion that many patients supposed to be syphilitic have really been actinomycotic. Poncet (Glasgow Med. Journal, Apr., '95).

Lupus.—The diagnosis depends, in this condition, upon microscopical examination.

Etiology.—Both men and animals are probably infected from vegetables or water (Israel), from eating ears of barley, or rye, when the fungus penetrates through the wound or abrasion thus provoked, or in many cases through carious teeth. Intestinal actinomycosis is due to taking contaminated food or water, when the fungus becomes implanted upon an already-diseased tissue, multiplies, and causes active proliferation of the submucous tissue.

Case where the affection was transmitted by kissing, between bridegroom and bride. Baracz (Wiener med. Presse, Jan. 6, '89).

[Farmers should be warned against the habit so common among them, of chewing bits of straw, wheat, oat-chaff, etc., the most prolific cause of the disease. E. Laplace.]

Literature of '96-'97-'98.

Actinomycosis is frequently met with in shoemakers. This is due to their habit of placing their needles in their mouths. Ullmann (Le Bull Méd., Nov. 17, '97).

Pathology.—The actinomycoses were formerly thought to be mold-fungi (hyphomycetes), but Bostroem, in 1885,

proved by cultivating them that they were a variety of cladothrix, belonging to the schizomycetes.

The mass is made up of granulation tissue, which, except for the presence of the ray-fungus, should be mistaken for a round-celled sarcoma. Epithelioid elements and giant cells are also seen. In the granular mass, or in the pus coming from a case of actinomycosis, the fungus itself appears under the form of small, yellow, brown, or even green masses, about a pin-head in size, which, on microscopical examination, are found to be composed of a central interwoven mass of threads, from which radiate club-shape-ended rays; in some specimens certain rays project far beyond the others. In man the clubbed bodies are frequently absent (Senn). The histological lesions are alike in the actinomycotic nodule and in the tuberculous follicle; only the foreign body differs. Water or a weak solution of sodium chloride causes the rays to swell enormously and lose their shape; ether and chloroform have no action upon them.

At a certain stage there are in every colony three elements,—viz.:—

1. Club-shaped formations.
2. A centrally-placed net-work of fungous filaments of varying shape and size.
3. Fine coccus-like bodies (spores), which originate from the fungous filaments, and grow into long rods and branching twigs.

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Typical actinomycosis is the disease in which occur the characteristic mycelial masses, having club-shaped radiations. Atypical actinomycosis includes such diseases as Nocard's *farçin de bœuf*, and infections which clinically and anatomically resemble actinomycosis, and are caused by branching mycelial organisms which correspond quite closely to the cultural peculiarities of the streptothrix actinomyces, but fail to form the characteristic grains in the tissues and pus. Berestneff (Zeit. f. Hyg. u. Infekt., vol. xxix, p. 94, '98).

Staining.—The following stains have been used:—

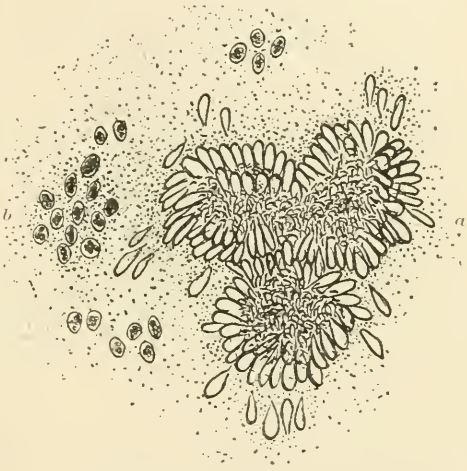
Wedl's orseille (Weigert).

Eosin (Marchand).

Cochineal—red (Dunker and Magnussen).

Hæmatoxylin alum (Moosbrugger).

Gram's method — section staining (Partsch).



a, Ray-fungus or masses, showing central mycelium of actinomycosis. *b*, White blood-corpuscles, showing their relative size. (*Poncet and Bérard.*)

Safranin in aniline oil, followed by K. I. (Babès).

Solution of orcein in acetic acid (Israel).

Picrocarmin—fungus, yellow; other parts, red (Baranski).

The actinomyces in a section are best shown by Gram's method, first with methyl-violet, then with Bismarck brown (Tillmann).

Cultivation.—It is difficult to cultivate in coagulated blood-serum (O. Israel), coagulated blood-serum and

agar-agar (Boström), and coagulated egg-albumin and agar-agar (Wolff and J. Israel).

In cultures authors have not been able to detect anything like the genuine terminal clubs such as are met with in actinomycotic products. These clubbed extremities are supposed to exist only in very old fungi, for in sputa they are often met lying in enormous quantities side by side with clubless ones.

Any contamination with other bacteria interferes very materially with the growth of the actinocladothrix, since the former begins to proliferate far more rapidly than the latter, penetrate into the grains themselves, and make a pure culture of the cladothrix impossible. As the ordinary methods of isolation here prove inefficient, the following precautions have been devised:—

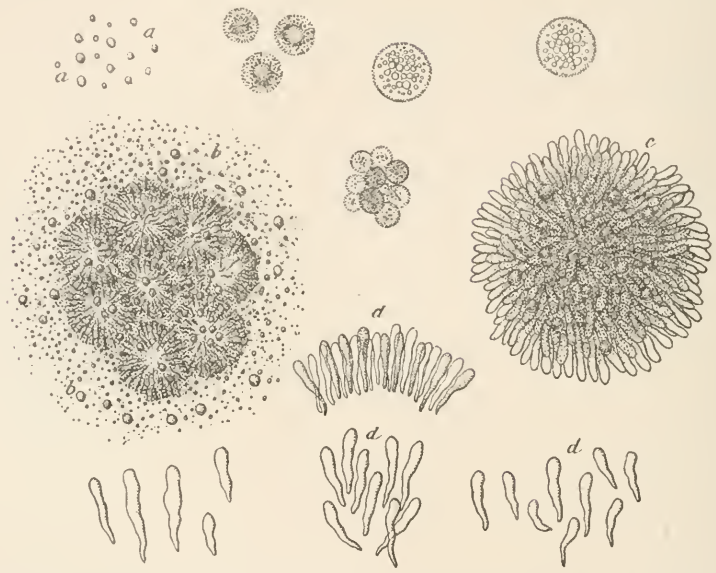
1. Take about ten large glass plates, with solidified meat-peptone-agar.

2. Pick out from sputa or pus a large number of grains, 50 or 100 or more, and distribute them over the plates at a distance of from three to five centimetres (1 to 2 inches) from each other.

3. Place the plates in the thermostat and carefully examine each day, by means of a magnifying glass, in order to make out which grains remain pure and which are contaminated.

4. Protect the pure ones from contamination be removing them to another plate, with a freshly-prepared medium.

5. If the selected colonies show no sign of contamination, in from four to six days, they are then to be subjected to further cultivation experiments, after the method already indicated. Afnassief and Schultz (Münchener med. Woch., June 11, '89).



Ray-fungus (*c*, *c*, *c*), club-shaped bodies (*d*, *d*, *d*), and spores (*a*, *a*, *a*) found in the pus of actinomycosis. (*Poncet and Bérard.*)

Literature of '96-'97-'98.

From 5 typical cases of human actinomycosis numerous inoculations were made upon various media, which were kept partly under aërobic, partly under anaërobic, conditions; growth of streptothrix actinomyces took place in only 20 of 64 primary cultures. After the first generation the organism did better when grown without oxygen; the actinomyces grew well when inoculated in eggs in the usual manner. The colonies consisted of

longer and shorter threads which stained by Gram's method, and always presented true branching, although sometimes the branches were hard to find; the cultures were rather short-lived; in one case the growths lived through 11 generations during 7 months; in two cases through 4 generations in 3 1/3 months, but in five cases death occurred after the first generation. In inoculation-experiments on rabbits, guinea-pigs, and mice a fatal actinomycosis was not produced, although many features recalled the pictures of the disease. Francis Harbitz (Norsk Mag. f. Lagevid., vol. lix, p. 1, '98).

Inoculation.—It has been successfully carried out by James Israel and Ponfick, from tissue and from pure cultures.

In one inoculation experiment a characteristic deep-yellow tumor was found in the liver, proving a general infection. In all other inoculation experiments the author had found the tumor remaining limited to the peritoneal cavity and consequently improbable of causing general infection. Max Wolff (Deutsche med. Woch., Mar. 1, 8, '94).

Opinions differ as to its power of producing pus; a secondary infection by the pus-germs being thought the true cause of the pus sometimes found with actinomycosis. Dissemination by the lymphatic system never occurs. Glandular enlargement indicates secondary infection.

Literature of '96-'97-'98.

In pure infection with the actinomyces fungus the pus secreted is not always thin. This fungus alone, without the admixture of the ordinary pus-producing micro-organisms can produce suppuration. The entrance of the common pus-producing micro-organisms into actinomycotic foci does not kill the fungus; but, on the contrary, may bring about such conditions as favor its development. Kozerski (Archiv f. Derm. u. Syphilis, B. 38, H. 2, '96).

1. Cutaneous Surface. — Around the primary lesion are small secondary lesions. Two forms are described: (*a*) The anthracoid, which pursues a rapid course, with fever, and sometimes septicæmic in character. It is characterized by flat tumefaction, with multitudes of small openings with yellow granulations, from which thick pus exudes. (*b*) The ulcero-fungous, which pursues a subacute course, with tendency to chronicity. In the face it tends to form burrowing abscesses instead of recognizable tumors.

2. Bronchial Tubes and Lungs.—Some observers believe that the peribronchial lymphatic vessels and glands disseminate the fungus or its spores in the lungs; when the fungus reaches the lung-tissue proper, granulation tissue is formed, which, through secondary infection, suppurates. Amyloid degeneration of other organs may occur, or metastasis of the disease, in case a pulmonary vein has been pierced. At times the pericardium or peritoneum becomes affected. (Strümpell.)

Literature of '96-'97-'98.

Case of actinomycosis of pleura and chest-wall in a child, aged 6, admitted into St. Bartholomew's, suffering from empyema of the left side. History of bronchitis and pain in the left side, but from this recovery had apparently taken place. Six ounces of curdy pus evacuated, revealing actinomycosis. The temperature remained high. Three swellings successively opened. As sinuses persisted, the patient was put in a bath of weak iodine and under iodide of potassium marked improvement, when death occurred under chloroform administered for the extraction of a tooth. Left lung found quite collapsed, but otherwise normal, and incased in a brawny material containing abscesses. Prolonged search needed to discover actinomycosis. F. S. Eve (Brit. Med. Jour., Apr. 10, '97).

3. Alimentary Canal.—In the jaws

the mass usually resembles a sarcoma, but, if incised before secondary infection and suppuration has occurred, the reddish surface will be seen to be intermingled with yellowish spots, which are collections of actinomyces.

In the intestines the fungus causes proliferation of the submucous tissue, and whitish patches in the intestines. External fistulæ are commonly found.

Literature of '96-'97-'98.

Actinomycotic growths in the liver in man have a characteristic naked-eye appearance, from their peculiar honeycombed structure. The cases between the fibrous trabeculæ are full of caseous matter in which the more or less spheroidal masses of the fungus are imbedded. In museum specimens, which have been for some time preserved in spirit, the contents of the loculi may have fallen out, and the honeycombed appearance is then much more marked than in recent specimens. Crookshank Lancet, Jan. 2, '97).

Condition of metabolism in patient subject of toxic influence of actinomycosis. Of abnormal elements in the urine, albumin and peptone (?) were found in traces, while urobilin was present in extremely slight amount. Acetone and sugar absent; nitrogen-excretion largely exceeded ingestion; reaction of urine was not distinctly changed; urea was slightly decreased. Alloxur bodies varied proportionally to variation in excretion of nitrogen. Uric acid bore no definite relation to amount of xanthin bases. Ammonia was not increased, while total sulphates bore direct relation to amount of nitrogen, but ethereal sulphates are not increased. Excretion of phosphates not changed, except slight decrease in amount of earthy phosphates and chlorides. R. Schmidt (Centralb. f. innere Med., Feb. 26, '98).

Prognosis.—The prognosis is serious in proportion to the rapidity with which suppuration occurs. Actinomycosis of the upper jaw is more serious than actinomycosis of the lower jaw, as it has a greater tendency to invade the deep structures. Internal actinomycosis is almost always fatal, owing to inaccessibility. External actinomycosis may cause death from pyæmia, septicæmia, and exhaustion. When so placed as to be easily removed and treated early the prognosis is favorable. A permanent recovery usually follows a complete removal of the primary focus, as metastasis is rare. (Senn.)

Actinomycosis has a pronounced tendency to spontaneous recovery except in internal organs. (Schlange.)

From an analysis of sixty cases the following conclusions are reached: When the disease involves the head and neck, except in a few cases when the base of the skull is invaded, the course is favorable, recovery taking place in from three to nine months. It is exceptional for the fistula to persist or to form anew, after the lapse of a year. Pulmonary actinomycosis may terminate in recovery. The prognosis of actinomycosis is the more favorable as the anterior abdominal walls are involved and the posterior escape. Death usually results from amyloid degeneration and wasting. If actinomycosis present pyæmic manifestations, a fatal termination is to be expected, as a number of vital organs are likely to be involved. Actinomycosis may pursue a chronic course, continuing thirteen years or longer, if functionally important organs be not involved, as when the process confines itself to the connective tissue about the spinal column.

Treatment.

1. General.—Potassium iodide was found useful in animals by Thomassen and Nocard. In man it should be thoroughly tried before surgical intervention is resorted to, especially when the dis-

ease is so extensive as to prevent complete removal by surgery. The results obtained from iodide of potassium have been remarkable in some cases and negative in others. This divergence of views, according to Pernet, depends on the variation in the virulence of the disease, in its evolution in different individuals, in the difference existing in the receptivity of the tissues, and on the influence of secondary infective processes. In recent and purely actinomycotic lesions the results may be excellent; in old-standing cases, and where the ray-fungus is associated with streptococci, staphylococci, and the bacterium coli commune, the drug treatment is less successful.

The treatment is most successful when decided iodism is produced. Buzzi and Galli Valerio (Riforma Med., May 6, '93).

Literature of '96-'97-'98.

Case in a man, aged 34 years, who suffered from abscess of the lower jaw. The diagnosis of actinomycosis was made by bacteriological examination. Seventy-five grains of potassium iodide were given daily; the fistulæ were treated by injection of iodine tincture, and the diseased regions treated with iodine-glycerin. A complete recovery ensued in four months. Duguet (Bull. de l'Acad. de Méd., July 21, '96).

Case in a man, 23 years old, who had never taken care of animals and who received a blow on the left cheek. There was a fluctuating swelling the size of a peach-stone, resembling a glandular abscess. The teeth were in a bad condition, but the patient had never suffered from them. In the cervical region a subcutaneous tumor was situated to the outside of and half-way up the sterno-mastoid muscle. On the tumor of the cheek being pierced, improvement immediately followed the administration of iodide of potassium. Guillemot (Lyon Méd., Jan. 26, '96).

Two cases, one of severe jaw actinomycosis and one of actinomycotic perityphlitis, cured by the use of iodide of potassium. Experiments showing that the remedy does not destroy the actinomycosis, but hinders its development and reproduction. Josef Jurinka (Mittheilungen aus den Grenzgebieten d. Med. u. Chir., vol. i, H. 2, '96).

Severe case of actinomycosis in which patient was ordered to take 15 grains of iodide of potassium three times a day. After this date there was no further extension, discharge had ceased, though a sinus was still open; an old, indurated track from the cheek to the cavicle was easily felt. The sinus closed and the induration along the track of the inflammation was the only mark of the disease. This gradually faded, and there was no recurrence. Colvin B. M. Smith (Lancet, Mar. 13, '97).

Case of actinomycosis in which eleven months of treatment with iodide of potassium failed to influence the local process; the latter had progressed and the number of fistulæ was materially increased. Parker Syms (Annals of Surg., Feb., '97).

In two-thirds of the cases of chronic actinomycosis of the face and neck, the results of iodide treatment are *nil*. In three-fourths of the recent cases recovery has been obtained by it, combined with surgical treatment, and in one-fourth by iodide treatment alone. Potassium iodide cannot be regarded as specific in actinomycosis in man. If, at the end of some weeks, improvement is slight only, operative interference should be carried out at once. Bérard (France Méd., '97).

Iodide of potassium does not act on the parasite itself, as cultivations of the fungus in the usual media are not influenced by it in any way. The drug, to be efficacious, must be given in doses of from 15 to 90 grains a day for some weeks. Some observers record immediate and lasting effects from its use; others regard the surgical treatment of primary importance. George Pernet (Brit. Jour. of Derm., Oct., '97).

Case of actinomycosis appearing in and limited to the skin. Patient had suffered on and off from the disease for six years. For last three there had been persistent

ulcer on right thigh. Careful examination of pus revealed presence of ray-fungus. Sixty grains of iodide of potassium a day caused the whole ulcer to become shallower and more covered. Kamen (Wien. med. Woch., No. 18, '98).

The injection of a 5-per-cent. solution of permanganate of potassium into the cysts has been of advantage.

Literature of '96-'97-'98.

Case in which a swelling over the twelfth rib near the spine caused severe pain. The hypodermic injection into the mass of 15 minims of a 5-per-cent. solution of permanganate of potash followed by marked relief. Iodide of potassium, 45 increased to 90 grains daily, had no control over the progress of the disease. H. B. McIntire (Boston Med. and Surg. Jour., Jan. 28, '97).

2. Surgical.—Local measures which do not completely remove the infected tissues do harm, as they frequently give rise to secondary infection, rapid extension, and death.

Cauterization with solid silver nitrate in actinomycosis of skin and soft parts in which suppuration and fistulous tracts have occurred possesses a specific action on the actinomycosis (Köttnitz).

Literature of '96-'97-'98.

Case in which local applications and injections of nitrate of silver and nitrate of zinc, both into the sinuses and directly into the tissues, caused some argyriasis, but recovery. A. Mayer (Annals of Surg., Sept., '96).

All recorded cases of actinomycosis of lung, with exception of two published by Schlange and a third by Jakowski, have ended fatally. Fourth case may be added in which cure personally effected by extensive operation, in which affected skin, fasciæ, and muscles were excised down to ribs. As the granulations extended underneath the skin and covered whole anterior surface of thorax from third to eighth rib, all this was removed, including pectorales muscles up to second rib above and sternal margin to left, together with part of anterior serratus and latissimus dorsi muscles. In sixth intercostal space was a fistula, through which parasite had crept to surface. Sixth rib, from axillary line to surface, was resected. It was then found that whole anterior part of thorax was converted into a cavity, containing actinomycotic granulations and pus. The seventh, fifth, fourth, and third ribs were therefore resected in addition, and whole diseased part laid bare. The surface was well scraped, and all diseased parts removed. Two tracts found to extend deeper into lung-tissue were also scraped out, and they, as well as adjoining affected lung-tissue, were burned away with Paquelin's cautery. The cavity was filled with iodoform gauze, and patient made good recovery. Iodide of potassium was administered. Karewski (Berl. klin. Woch., Nos. 15, 16, 17, '98).

Case of pulmonary actinomycosis which at first had been mistaken for gangrene. For fœtid breath and expectorations, oil of eucalyptus was prescribed, in doses of 5 grains at first; later 10 grains in gelatin capsules, every four hours day and night. Three inhalations daily were ordered of the remedy. Under this treatment a cure was rapidly attained. G. Butler (Nouv. Rem., xlv, p. 288, '98).

3. Electrotechnical.—Two platinum needles, attached to the two poles of a constant-current battery, are to be inserted into the tumor. Through the two needles a current of 50 milliampères is to be passed, while every minute some drops of a 10-per-cent. iodide-of-potassium solution are to be injected into the mass. The solution is decomposed into nascent iodine and potassium. This is repeated every eight days, each session lasting twenty minutes, under an anæsthetic. (Gautier.)

Before suppuration all diseased tissues, glands, etc., should be removed, and the parts, when possible, cauterized with the thermocautery.

After suppuration the parts should be treated as if they were tuberculous, curetting and packing with iodoform gauze (Senn).

Case of actinomycosis of the lower portion of the abdomen, communicating with the bladder, in which, when all had failed, a cure was effected after the use of fifteen tuberculin injections, commencing with $^1/_6$ minim and ending with 4 minims. After the usual disturbance, local and general, the growth disappeared entirely. Billroth (Wiener med. Woch., Mar. 7, '91).

ERNEST LAPLACE,
Philadelphia.

ACTOL.—Actol, or lactate of silver, is a bactericidal agent recommended by Credé and Bayer as a powerful disinfectant for wounds. It forms a soluble compound with the secretions and this, being absorbed, influences beneficially not only the lesion treated, but also the neighboring tissues. It is non-poisonous,—a point of great superiority over other equally active antiseptics.

Dose.—Subcutaneously, the drug is injected in ¼-grain doses, dissolved in 1 drachm of water. This may be repeated frequently. Locally, actol is used in the proportion of 1 to 4000; stronger solutions tend to color the skin of the hands.

Physiological Action. — Guinea-pigs were injected with 0.03 to 0.04 per cent. of their body-weight of lactate of silver, and received subsequently, after an interval varying from ten minutes to three hours, half a drop of a violent cholera culture. In every case the animals succumbed as rapidly as those used in controlling the results. Similar experiments with other animals and virulent diseases have given the same results, showing that actol possesses no value as a general disinfectant.

A series of experiments performed by Marx, however, have shown actol to be a powerful local disinfectant. Two series of researches with anthrax bacilli showed that, in the first place, it protected the seat of injection completely against the swarms of micro-organisms in the blood and that it had an actual local bactericidal action in respect to these bacilli.

Literature of '96-'97-'98.

In spite of its failure to produce an antitoxic serum, actol is one of the most powerful and at the same time most harmless bactericidal agents at present before the profession. Marx (Centralb. f. Bakteriol., Nos. 15 and 16, '97).

Therapeutics.—Actol may be injected under the skin in surgical affections. Credé has thus administered 15 grains in solution without witnessing the least untoward effect. Two grains to the ounce of water must not be surpassed in strength, however, lest the solution cause coagulation of the albumin of the subcutaneous tissue and arrest the dissemination of the remedy. In anthrax, furuncle, and erysipelas it is said to be effective when used in the above manner.

It may also be used in 1 to 4000 solutions as a mouth-wash, gargle, etc., in inflammatory and infectious disorders, owing to the favorable influence of silver salts upon mucous membranes in general.

ACUTE RHINITIS. See NOSE.

ACUTE YELLOW ATROPHY. See LIVER.

ADDISON'S DISEASE.

Definition.—A disease characterized by progressive asthenia, blood-impoverishment, frequent disorder of the gastric and intestinal functions, cardiac weakness, and irregular pigmentation of the surface in the form of bronze-colored

spots, and, when not interfered with, uniformly tending toward a fatal result. It was first investigated and described as a distinct form of disease under the name of "Bronzed Skin Disease" by Dr. Thomas Addison, of London, in 1855. Since that time it has very generally been called "Addison's disease," and associated with disease of the suprarenal capsules.

Symptoms. — Perhaps the earliest symptoms to attract attention in this disease are those of asthenia, or lack of energy and endurance, with a variable condition of the digestive organs, and slight anæmic appearance of the surface. As the disease progresses the asthenia is manifested by shortness of breath, hurried and irregular action of the heart, and great sense of weariness from very moderate exercise. Sometimes there are present vertigo, tinnitus aurium, and syncope. The appetite is variable, but generally impaired, with occasional attacks of pain in the epigastrium and left side of the chest, increased by attempts to exercise. Moderate constipation exists in most cases, but is interrupted by increasingly frequent attacks of diarrhœa, and sometimes vomiting.

The foregoing symptoms are so much like those of pernicious anæmia that Addison's disease might not be suspected until the characteristic pigmentation becomes noticeable on some part of the surface. In most cases the pigmented, or dark-brown, spots appear first on the face and backs of the hands, varying much in size and in color. The latter is generally at first a light-brown or olive hue, but grows darker and the spots larger as the disease progresses. Spots also appear around the nipple, in the axilla, on the genital organs, and wherever the surface is exposed to much friction from the clothing, and in some cases they spread until they occupy nearly the whole cutaneous surface, imparting to the patient much the same color as the mulatto or half-bred negro. (*See colored Plate I.*)

The palms of the hands and soles of the feet generally remain white. Brown or pigmented spots in many cases appear on the tongue and other parts of the mouth and in the vagina. Spots have been described on the serous membranes in a very few cases. (*See colored Plate II.*)

In a majority of cases the patients have complained of asthenia for a considerable time prior to the appearance of noticeable pigmentation on the surface. In a few instances the bronzed spots have been the first symptoms to attract attention. Cases in which bronzing does not accompany the other symptoms are not infrequent.

> Case of subacute suprarenal cachexia without pigmentation. The patient had shown only two symptoms: (1) an uninterrupted rise of temperature during a month and a half, and (2) a progressive cachexia marked by loss of flesh and inability to undergo any muscular strain. Death followed about two months after the beginning of the affection. On post-mortem examination only the adrenals were found diseased; they showed a caseous suppurative degeneration of tubercular origin. The mucous membranes did not show the smallest sign of pigmentation. R. Marie (La Presse Médicale, July 24, '95).
>
> Cases in which there existed pathological changes in the adrenals without the existence of pigmentary deposits in the skin or mucous membranes: Lejars (Bull. de la Soc. Anat., Mar.); Perry (Brit. Med. Jour., June 7); Pilliet (Bull. de la Soc. Anat., No. 26); Bradshaw (Liverpool Medico-Chirurgical Journal, July); Davidson (Liverpool Medico-Chi. Jour., Jan.); Blackburn (Jour. Amer. Med. Assoc., Mar. 31, '88). Cases of marked involvement of adrenals failing

Bronzing of the Skin in Addison's Disease (Byrom Bramwell)

ATLAS OF CLINICAL MEDICINE

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Appearance of the tongue and nipple in Addison's Disease (Byrom Bramwell)

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in the symptoms or bronzing: Virchow (Berliner klin. Woch., Apr. 29); Lamarque (Jour. de Méd. de Bordeaux, May 5); West (Brit. Med. Jour., Nov. 9); Perry (Brit. Med. Jour., Oct. 21); Griffiths (Brit. Med. Jour., Feb. 2, '89). Girode (Bull. de la Soc. Anat., Apr.); Barth (London Medical Recorder, May 20); Counsell (Lancet, May 3); Vaughan (Brit. Med. Jour., Nov. 15); Cagliati (Riforma Medica, No. 6); Jacquemard (La Loire Médicale, Aug. 15); Ritchie (Edinburgh Med. Jour., July, '90), and others.

Literature of '96-'97-'98.

Case of Addison's disease without pigmentation. At the necropsy each suprarenal body was found to be enlarged and adherent to the surrounding parts, and thickly studded with tubercles of the size of peas, some of which had softened in their centres and contained pus. There was no apparent implication of the solar plexus. J. B. Bradbury (Lancet, Oct. 3, '96).

Addison's disease with phthisis pulmonalis and a typical pigmentation of the skin, consisting of melanoderma with symmetrical patches of leucoderma. C. O. Hawthorne (Glasgow Med. Jour., Oct., '96).

In addition to marked disturbance of the functions of the respiratory, cardiac, and splanchnic nerves, as indicated by shortness of breath, irregular action of the heart, and frequent gastric disturbances, a few cases have been recorded in which delirium, coma, or epileptoid convulsions occurred near the fatal termination. Von Jaksch has attributed these symptoms to acetonuria.

The temperature during the whole progress of the disease seldom rises above the natural, and in the advanced stage is often decidedly below. Roux mentions a case in which the temperature was only 32.5° C. (90.5° F.) four hours before death. Again, in the advanced stage of many cases the hands and feet are uncomfortably cold, and the asthenia so profound that the patient cannot maintain the erect position without vertigo, cardiac palpitation, or syncope.

The disease usually runs its course and terminates in death in from one to three years. A few cases are on record that terminated in six months, and, perhaps, a larger number that were protracted to eight and ten years. Those of longer duration have generally been characterized by repeated periods during which they remained stationary for several months at a time.

[One such well-marked case came under my own observation. The patient, aged about 35 years, had been exposed to much hard service and confined air on board of one of the naval monitors in active service during the war, between 1861 and 1864. Some symptoms of the disease were manifested as early as in 1865, but they made slow progress, and appeared to have several periods of remaining stationary, and did not terminate fatally until 1875,—a period of ten years. During the last year he had been unable to walk more than a few steps without feelings of extreme exhaustion, and the final collapse resulted from protracted diarrhœa and vomiting. Large bronzed spots were on his forehead, temples, backs of his hands, and still more over the front part of his chest and abdomen. Like most cases of this disease, his emaciation was not extreme, though the hæmoglobin was notably diminished. N. S. Davis.]

Addison's disease may terminate in sudden death. Case in which the patient was supposed to be suffering from malarial cachexia and died in syncope. Autopsy revealed the true nature of the disease. Letulle (Bull. de la Soc. Anat., No. 6, '94).

Six cases in four males and two females. Duration varied between two months and six or eight years. Leva (Virchow's Archiv, B. 125, H. 1, '91).

Case that progressed rapidly, death occurring in five months. The patient had plaques of vitiligo on the hands.

Bureau (Gazette Méd. de Nantes, Feb., '94).

Death two months after the onset of symptoms in a case in which one of the capsules presented an old tuberculosis, while in the other there were only recent granulations. Death hastened by intercurrent erysipelas. Mouisset (Lyon Méd., May 27, '94).

Diagnosis.—The presence of increased pigmentation of portions of the skin or mucous membranes, with progressive asthenia, frequent gastric disturbances, and cardiac weakness constitute the chief diagnostic features of melasma suprarenale, or Addison's disease. Increased pigmentation alone is not sufficient to justify a diagnosis of this affection.

Literature of '96-'97-'98.

Much stress laid upon the pigmentation of the mucous membrane as a diagnostic point.

Case in which there was very dark pigmentation of the small-pox cicatrices, and an unusually large number of small pigmented freckles and flat moles. Byrom Bramwell (Brit. Med. Jour., Jan. 9, '97).

Possibility of diagnosing Addison's disease when the characteristic dicoloration of the skin and mucous membranes is absent: high-tension pulse or a very striking difference in tension between the peripheral pulse and that in the abdominal aorta. Neusser (Med. News, Sept. 18, '97).

The presence of sulphur in the pigment is characteristic of Addison's disease. T. Carbone (Giornale delits R. Accad. di Torino, May, '96).

Bronzed spots have been found in connection with a variety of malignant and other growths, especially in the abdomen and pelvis, with some cases of diabetes, exophthalmic goitre, and also in cases of pulmonary and peritoneal tuberculosis.

Literature of '96-'97-'98.

Case in which there was no tendency on the part of the discrete pigmented area to run together and become diffuse. The patches of pigmentation remained isolated throughout up to the time of death. These cases might be mistaken for various affections in which pigmentation occurs: idiopathic multiple sarcomata of Kaposi, xeroderma pigmentosum, pigmented lesions following syphilis, and lentigines. Trebitsch (Zeit. f. klin. Med., B. 32, S. 163, '97).

Case of sarcoma of the lungs, with symptoms of Addison's disease from involvement of the suprarenal capsules. F. A. Packard and J. D. Steele (Med. News, Sept. 11, '97).

Pigmentation of mucous membranes generally considered diagnostic of Addison's disease seems to be found under other conditions. It appears to occur in some cases as mere accident without obvious cause; it may also be associated with chronic gastric disease, such as carcinoma. Two cases of abdominal disease in which pigmentation was found on mucosa of mouth. In first case diagnosis lay between cirrhosis of liver and chronic peritonitis; in second there was cholangitis due to gall-stones, with tubercular disease of lung and testicles. In neither could Addison's disease be absolutely excluded, but group of symptoms by which it is distinguished did not occur. Nor can occurrence of this group be relied on as sure indication of disease of suprarenal bodies. Case noted in which weakness, anorexia, anæmia, vomiting, and diarrhœa were all present, but autopsy showed only chronic gastric catarrh without affection of suprarenals. In this case there was no pigmentation. Schultze (Deutsche med. Woch., No. 46, '98).

On the other hand, a few cases have been recorded in which there was profound asthenia, severe gastric disturbances, irregular and weak pulse, and early death from syncope, when the autopsy revealed both suprarenal bodies much enlarged from caseous and tuberculous degeneration, but no pigmentation or bronzed spots on either skin or mucous surface. Letulle reported a case of this kind in 1894. The patient was

supposed to be suffering from malarial cachexia, but died suddenly from syncope, and "the autopsy showed the two capsules to be transformed into fibro-caseous blocks as large as a mandarin orange." There is at present no known reliable mode of completing the diagnosis of such cases during the life of the patient.

Direct relation between diseases of the adrenals and bronzing of the skin denied. Case where one suprarenal body was intact, the bronzing nevertheless appearing. Two cases in which extensive tuberculosis of both adrenals was present without a trace of dermal discoloration. Where there is discoloration there is extensive disease of the nerves and ganglia of the abdominal sympathetics. Lancereaux (Arch. Gén. de Méd., Jan., '90).

A similar view. Nothnagel (Med. Press and Circular, Jan. 12, 19, '90).

The true origin of the bronzing may still be said to be unknown, although several plausible theories have been advanced. In the cutis there are chromatophorous cells, which, as is the case in the frog and chameleon, are under direct nervous control, and they yield an excess of pigment of the Malpighian layer under certain conditions of nervous disorder. Raymond (Lancet, July 2, '92).

Examination of the skin in one case. Coloring composed of pigmented clasmatocytes, which, after penetrating by migration, fix themselves upon the supporting elements of the derma. Ch. Audry (Le Midi Médical, July 29, '94).

Masses of medullary cells and even buds of the substance of the suprarenal capsules in the interior of veins, more frequently in the medullary than in the cortical substance found in man. The same peculiarities were noted in the horse, ox, pig, and sheep. The medullary tubes, the central portion of which is filled with brown, hyaline masses secreted by the double row of cells seen on their interior, project into the lumen of the veins, at this point deprived of their endothelial covering. Conclusion that the brown, hyaline masses are secreted by the suprarenal capsules, and that they are carried into the circulatory stream after penetrating into the interior of the veins. P. Manasse (Revue des Sciences Méd., July 15, '94).

The melanodermia of Addison's disease is to be observed whenever the periphery of the organ, the cortex, the nerve-filaments, or the ganglia of the region are involved. On the other hand, it is difficult to distinguish which phenomena are due to toxæmia. Bedford Fenwick, Greenhow, Jürgens, Kalindero, Babès (Brit. Med. Jour., Mar. 30, Apr. 6, '95).

Discovery of a pigmented body, the size of the head of a large black pin, and presenting the complete histology of a suprarenal capsule in contact with the semilunar ganglion. Pilliet (Bull. de la Soc. Anat., No. 10, '91).

Etiology.—Well-marked cases of melasma suprarenale are of comparatively rare occurrence in this country. Of the cases on record, much the larger number were in persons between the ages of 20 and 40 years; and more than 60 per cent. were in the male sex. Greenhow collected 183 cases, of which 119 were males and 64 females. Belaiëff has recorded one congenital case, the child living eight weeks after birth, the skin presenting a yellowish-gray color, and an autopsy showed the suprarenal capsules enlarged and filled with cysts. Another case has been reported in a child only 8 days old. Its skin was "mottled and yellowish-brown." An autopsy revealed enlargement and congestion of the middle third of the right suprarenal capsule, and hæmorrhage with caseous degeneration in the left.

Literature of '96-'97-'98.

Records collected of 48 cases of Addison's disease occurring during childhood. Youngest child was 7 days, eldest 14 ½ years. The affection, almost invariably due to tuberculosis, is usually first manifested by vague symptoms, such as weak-

ness, anæmia, loss of weight, gastro-intestinal symptoms, nausea, vomiting, and diarrhœa. Pain and pigmentation are quite uncommon in children. Convulsions are usual, intermissions frequently occur, and the disease pursues a more rapid course than in adults. Dézirot (Jour. de Méd., Aug. 28, '98).

On the other hand, one or more cases have been recorded as occurring as late in life as 70 years.

As predisposing causes, we find enumerated excessive physical labor, mental anxiety and depression, caries of the spine, confinement in damp and ill-ventilated rooms, insufficient food, blows upon the abdomen, and tuberculosis of the peritoneum. Greenhow claimed that nine-tenths of the cases collated by him had occurred among the laboring classes. Nearly all the conditions mentioned as predisposing causes are the same as are generally alleged to predispose to pulmonary and other varieties of tuberculosis. The more efficient or direct cause of the disease under consideration appears to be an interruption of the functions of the suprarenal capsules. According to Lewin, some degree of structural disease of these capsules is found in 88 per cent. of all the cases, and by far the most frequent of these changes is of tubercular character.

Tuberculosis is the most frequent and important change in the adrenals in Addison's disease. The various other changes in these bodies—as chronic inflammation, caseation, or calcareous infiltration—are to be regarded only as the different results of the tuberculosis. Alezais and Arnaud (Revue de Méd., Apr., '91).

Typical case in which the suprarenals were both enlarged and cheesy, the abdominal sympathetics being enlarged and red to the naked eye, associated with pulmonary tuberculosis and Pott's disease of the spine. Tyson (Univ. Med. Mag., Sept., '91).

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It has been proved that the etiological factors underlying Addison's disease are not dependent upon the presence or absence of the adrenals alone. The chief symptoms of Addison's disease can be produced by lesions of ganglia in close association with the adrenal blood-supply. A. F. Jonas (Annals of Surg., Apr., '98).

Pathology.—The post-mortem examination of the case just related showed, in addition to the bronzed spots on the surface, the cavities of the heart moderately filled with blood only partially coagulated; the liver and spleen of natural size and color; the mucous membrane of the stomach and ileum congested, softened in some places with abrasions; and the suprarenal capsule much enlarged. No other morbid appearances were noticed in the abdominal viscera. An incision through the centre of the suprarenal capsules revealed a central caseous mass in each, of the consistence of new cheese, about thirty millimetres in diameter, inclosed in a sac of gray, fibrous tissue, with some spots and streaks of yellowish color. On the surface of the caseous mass next to the surrounding capsule was a thin layer of a creamy consistence, and the fibrous capsule under the microscope showed the presence of fusiform, lymphoid, and large granular or giant cells in considerable numbers. Both capsules presented the same appearance and were undoubtedly good specimens of tuberculous disease.

The two most constant anatomical changes found in Addison's disease are the pigmented spots consisting of granular pigment deposited in the deeper layers of the rete Malpighi and the caseous or tuberculous degeneration of the suprarenal capsules. Of 375 cases collected by Lewin, in 288 the

suprarenals were found tuberculous, and in many other cases they were affected with inflammation, cysts, atrophy, carcinoma, or sarcoma.

Case of typical Addison's disease in a woman 67 years of age. Both capsules were very much enlarged, easeated, and adherent; no apparent lesions in the neighboring large ganglia, and no tuberculosis of other organs. Accorimboni (Riforma Medica, Aug. 29, '91).

Case in which the tubercular nature of the lesions in the suprarenal bodies was demonstrated. Death took place with absolute suddenness. The autopsy showed slight evidence of tuberculosis of the lung. One suprarenal capsule presented a very pronounced caseation, and was large and lumpy. In the other the lesion was much less pronounced. The capsule was not greatly enlarged, but its normal tissue had disappeared, and its place was taken by a general, homogeneous, tough tissue, in which were a few caseous centres. Microscopical examination demonstrated that the lesion was tubercular, and there were tubercular bacilli in the capsules. The bacilli were not numerous, but unequivocal. Joseph Coats (Glasgow Med. Jour., Aug., '92).

Five cases of Addison's disease which had been examined, first clinically and afterward post-mortem. In all of them the suprarenal capsules were found diseased. In four they were extremely tuberculous, three showing the disease on both sides, and one on one side only. In the fifth case there was a carcinomatous degeneration of the left suprarenal as well as left-sided pulmonary cancer. Posselt (Centralb. f. klin. Med. Feb. 5, '95).

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Two cases of Addison's disease in girls of 14 years and 14 ½ years of age, which terminated suddenly in death. In second case autopsy showed extensive and thick adhesions of costal and parietal pleura and disseminated miliary tubercles in both lungs. The heart was relaxed, but without valvular lesions. Liver was adherent to diaphragm and to adjacent organs by quite firm false membranes. Kidneys were normal. Both suprarenals were greatly enlarged and of firm consistence. Greater part of parenchyma was replaced by caseous, confluent yellowish tubercles. Variot (Jour. de Clin. et de Thér., No. 2, '98).

Case of Addison's disease in a boy, 14 years old, suffering from old pulmonary tuberculosis, with recent miliary outbreak; considerable epigastric pain during life. No pigmentation of skin. Post-mortem disclosed, in addition to lung-condition, enlarged and pigmented bronchial glands, enlarged and firm mesenteric glands, with congestion of liver, kidneys, spleen, and intestines. Capsules of suprarenal bodies were thickened and adherent to surrounding tissues. Each suprarenal body was four times normal size. On section they were caseous, and contained cretaceous nodules. Microscopically mesenteric glands showed small-cell infiltration without giant-cells. Periphery of suprarenals was rich in typical small tubercles, many containing large, multinucleated giant-cells. Signs considered of diagnostic importance were extreme asthenia, emaciation, anorexia, vomiting, abdominal pain, and small, rapid pulse. J. Anderson (Lancet, June 18, '98).

Next in frequency to the suprarenal capsules, the ganglia of the sympathetic system of nerves have been found altered in structure, especially in the neighborhood of the capsules. In many cases structural changes have been found to co-exist in both the capsules and the ganglia of the sympathetic in the same patients. On the other hand, a few cases have been reported presenting all the clinical symptoms of Addison's disease, in which the autopsy failed to find any structural changes in either the suprarenal capsules or the nerve-ganglia.

Four autopsies suggesting that the disease is due to irritation of the abdominal sympathetic from direct lesion of the nerve, its ganglia, or the suprarenal capsules. This lesion is most fre-

quently primary or secondary to tuberculosis of the capsules with secondary involvement of the sympathetic. In less than 20 per cent. it is not tuberculous, and in 12 per cent. of the cases the capsules remain normal. Thompson (Amer. Jour. of the Med. Sciences, Oct., '93).

To be regarded as a functional whole, the cortex and the medulla doing the same work, but in unequal degrees. Atrophy of the suprarenal capsules occurs normally in old age, but may occur earlier in life and cause Addison's disease. Hæmorrhage into the substance of the gland may be due to traumatism either later in life or in infants at birth. Fatty and lardaceous degenerations occur. The glands have been found to contain cysts. Out of one hundred and thirty-one cases in which death was due to tuberculosis, the glands were tuberculous in eighteen, without, however, there being any signs of Addison's disease. Rolleston (Lancet, Mar. 23, '95).

Investigations upon rabbits and dogs showing that the adrenals stand in intimate relation with the central nervous system, and that their affection is the cause of the train of phenomena known as Addison's disease. Tizzoni (London Med. Recorder, Feb., '90).

Not the great sympathetic nerves and ganglia, not the suprarenal capsules themselves, but the pericapsular nerve-ganglia constitute the especial starting-point for the development of the symptoms of Addison's disease. Alezais and Arnaud (La Semaine Méd., Oct. 7, '91).

Case in which, associated with the ordinary symptoms, there occurred a sudden attack of bromidrosis, indicating a rather serious involvement of the sympathetic nervous system. Ohmann-Dumesnil (Atlanta Med. and Surg. Jour., July, '90).

Case in which the typical changes were encountered, and in which there was found a chronic spinal sclerosis of the posterior root-zones, with a neuritis attacking especially the posterior roots of the spinal nerves. Marked by a swelling of the axis-cylinders, their rupture at places, and a multiplication of cells. Kallendro and Babès (La Semaine Méd., Feb. 22, '89).

Case of complication of Addison's disease with exophthalmic goitre, illustrative of sympathetic involvement in two of its centres,—the cervical and abdominal. Oppenheim (Deutsche medizinal-Zeitung, Dec. 29, '88).

Six cases of adrenal caseation, in some of which there was distinct round-celled infiltration of the semilunar ganglia without bronzing of the skin. Addison's disease cannot be said to be directly due to changes in the sympathetic abdominal ganglia, although, perhaps, this or that symptom of the affection may depend on such involvement of the sympathetic ganglia. Von Kahlden (Münch. med. Woch., June 23, '91).

[The cases of adrenal involvement without co-existing pigmentary changes lend considerable weight to the assertions of those pathologists who find Addison's disease rather a disease of nervous origin than one involving a glandular organ. This opinion is further strengthened by the finding of pigmentary changes in cases presenting no demonstrable change in the adrenals. Another point of no slight weight may be taken in the suggestion of Jürgens, that at least a certain class of pigmented instances are due to peripheral nervous irritation, possibly from epithelial degeneration or actual external irritation, mostly met about the flexures, folds, and in the face, from exposure. This last suggestion is further borne out physiologically from the pigmentation often caused by the constant wearing of even non-metallic objects, as buttons, next the skin.

The opposite view—*i.e.*, of glandular destruction—cannot, however, be set aside, numerous careful observations and the results of various experimenters offering weight in this direction.

As to the nature of growth found in the suprarenals, there can be but little doubt that other new formations than tuberculosis are attended by the complex of symptoms of Addison's disease. Tyson and Smith, Assoc. Eds., Annual, '89.]

The primary morbid conditions or processes on which depend the develop-

ment of the clinical phenomena of Addison's disease have not yet been so clearly demonstrated as to remove the subject from the fields of controversy or doubt.

Much the larger number of writers incline to agree with Dr. Addison, who ascribed all the essential symptoms and results of the disease to interruption of the function of the suprarenal capsules caused by some form of disease in those organs. Those holding this view assume that these bodies either destroy some toxic element resulting from natural metabolic changes in the blood or tissues, or secrete and return to the blood some substance necessary for the maintenance of health.

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Pyrocatechin, found in the medulla of the suprarenal gland, becomes brown in contact with air or alkaline tissues. It is converted in Addison's disease into a poisonous compound on leaving the suprarenal body and entering the circulation. In health the elimination of pyrocatechin occurs through the agency of the sympathetic ganglion-cells. The debility, etc., are the signs of chronic poisoning with pyrocatechin,—an autotoxication. Mühlmann (Münchener med. Woch., Feb. 16, '96).

Certain changes in the suprarenal capsules—such as hyperæmia, hypertrophy, etc.—are noted when certain poisons are introduced into the system, especially if slowly given: cloves, toluene-amin, toxins of bacilli, etc. (Roux and Yersin, Roger, Pilliet, Charrin and Langlois.)

The toxic power of the extract of suprarenal capsules was noted by Foà and Pellacani (1884), and has been examined since then by many authors. It causes a rise in the blood-pressure combined with slowing of the heart. (Cybulski, Olivier and Schäfer.)

Capsules which are affected with hyperæmia still contain the principle which gives rise to the above effect (not pyrocatechin); but capsules hypertrophied to double or more their original size no longer contain it. P. Langlois (Arch. de Phys., vol. viii, p. 152, '96).

The suprarenal capsules are intended for the destruction of the red blood-corpuscles, which give up their hæmoglobin to the medullary cells of these organs under the form of pigment. Blood poisons—such as formol, aniline products, mineral poisons, sodium nitrate, and uranium nitrate—cause congestion of the capsule, excess of pigment in the cells of the medullary region, and hæmorrhages into the same region. The blood passes through the capsule from the centre toward the periphery, giving up its hæmoglobin to the medullary substance or to the deeper portion of the cortical substance. When the gland has taken up all it can, other mesodermic elements assume its functions, such as white blood-globules and connective cells of the skin. This gives rise to the pigmentation of the skin in certain destructive lesions of the capsule. A. Pilliet (Arch. de Phys., vol. vii, p. 555, '96).

Brown-Séquard claimed that the pigment derived from the disintegration of red corpuscles of the blood was destroyed in the suprarenal capsules. If this is true, any disease affecting them sufficiently to suspend their function should be followed by increased pigmentation and possibly give rise to all the other symptoms of the general disorder. Direct experiments on animals for the purpose of determining the real functions of the suprarenal bodies by several investigators have resulted so variously as to lead to contradictory conclusions. After total extirpation of both suprarenal capsules in one hundred and fifty-three animals no changes in pigmentation or other symptoms of Addison's disease were observed. (Nothnagel.)

Similar experiments performed on cats and dogs, followed by the same negative results. W. G. Thompson (Amer. Jour. Med. Sciences, Oct., '93).

In neither of these cases, however, are

we informed as to how long after the extirpations the animals were kept under observation. On the other hand, Tizzoni, who kept rabbits alive two and three-fourths years after crushing the adrenals, claimed that pathological pigmentation and some multiple degenerations in the spinal cord developed. The experiments of Abelous and Langlois also appear to prove that animals deprived of these bodies die with symptoms of toxæmia.

The symptoms of the affection indicate an intoxication, the experiments of Abelous and Langlois having shown that animals deprived of the capsules die poisoned, and that their blood shows a special toxicity. If a small portion of the suprarenal parenchyma be retained, the intoxication is neutralized and life remains possible. In Addison's disease, adynamia, gastric disturbances, and the terminal symptoms of cardiac collapse (hypothermia and coma) appear to be purely toxic phenomena, although these have not always been provoked with hypodermic injections of suprarenal juice. All the symptoms do not depend upon intoxication, however, the pigmentation of the skin and mucous membranes being in relation to lesions of the sympathetic. Chauffard (La Semaine Méd., Feb. 14, '94).

The suprarenal bodies elaborate a substance which has a very powerful action on the muscular tissues and more especially on the muscular coat of the arteries. It causes, in very small doses, an enormous heightening of the blood-pressure, dependent upon contraction of the peripheral vessels, due to a direct action of the substance on the muscular coat, and not to any action on the medullary vasomotor centre. It also acts directly on the heart, producing augmentation and acceleration, provided the vagi are divided. On the voluntary muscles its action is such that the period of contraction is slightly and the period of relaxation greatly prolonged. On respiration more marked effects are obtained in rabbits than in dogs. In cases of Addison's disease no physiological action from the extract of the diseased capsules obtained. It is possible that the phenomena of Addison's disease are due to the absence of this active principle. Schäfer and Oliver (Practitioner, Sept., '95).

One of the functions of the capsules is to destroy a part of the used-up red corpuscles. If this excretory or depurative function is interfered with, the circulation of the decomposition products of hæmoglobin causes Addisonian poisoning. Rôle attributed to the medullary substance. The rôle of the cortical substance is that of furnishing a secretion that is taken up by the lymphatics, and which is indispensable to the needs of the organism. Auld (Brit. Med. Jour., May 12, '94).

[Auld thus appears to assign to the suprarenal bodies a double function. N. S. Davis.]

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Results of experiments on one hundred and nine rats from which both suprarenal capsules were removed, and others in which these bodies were cauterized or otherwise inflamed. After the lapse of a few months a large number of these animals showed an infiltration of the pigment in the subcutaneous cellular tissues, in the lumbar and mesenteric glands, in the peritoneum, mesentery, liver, spleen, and lungs. Muscular paresis had developed in some of them with increasing asthenia; and the injection of an extract from the muscles of such rats proved fatal to other rats. Boinet (La Semaine Méd., No. 8, '96).

This view of the functions of the capsules, in connection with the fact that some form of disease has been found in them in nearly 90 per cent. of all the cases on record, certainly points directly to interference with or interruption of such functions as the first link in the chain of pathological processes constituting the disease under consideration.

Another class of writers and investigators, however, finding evidence of

structural changes in a considerable number of cases of Addison's disease in the ganglia of some parts of the abdominal sympathetic system of nerves, have claimed that these changes are the primary pathological steps, and that all the general phenomena result from trophic influences. Prominent among those advocating this view are Riesel, Burgen, and W. G. Thompson, while Alezais and Arnaud claim that the primary seat is neither in the ganglia of the sympathetic nerves nor in the suprarenal capsules proper, but in the pericapsular nerve-ganglia themselves.

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Case in which there was a sudden and maniacal attack the day before death lasting several hours, dissections showing caseous suprarenal bodies and the thickening and matting of the tissues in the neighborhood of the semilunar ganglia and solar plexuses. Lindsay Steven (Lancet, Oct. 31, '96).

Certain vasodilator fibres run in the splanchnic nerves to the adrenals. In the dog the splanchnics, after traversing the diaphragm, give off on each side, before they enter into the formation of the solar plexus, a single large branch to the adrenals; these are thought to contain the chief vasodilator fibres, since, if divided, stimulation of the splanchnics in the thorax is without influence, while stimulation of the distal extremities of the divided nerves is followed by active hyperæmia. Arthur Biedl (Pflüger's Archiv, June, '97).

The theories of the changes in the great sympathetic system and of insufficiency of the capsules which have been opposed to one another as an explanation of the cause of Addison's disease each contain some truth, but are too exclusive. Where the capsules are either absent or not diseased, only the nervous theory can be upheld. Clinical research and experiments prove that pathological or experimental destruction of the capsules act not only by the ascending and secondary degeneration of the great sympathetic and its ganglia, but also by capsular insufficiency.

This suppression of the action of the capsules favors retention in the blood, viscera, and muscles of toxic products which appear to play a certain part either in the formation of pigment in the blood or in the production and increase of the asthenia. E. Boinet (Revue de Méd., Feb., '97).

In this connection it is proper to state that F. Marino-Zucco, Director of the Chemico-Pharmaceutical Institute of Genoa, has obtained neurin from the normal suprarenal capsules in notable quantity, and has detected the same substance in the urine of a patient with Addison's disease. This, with further experiments with neurin, led him to regard the retention of this substance, on account of disease of the capsules, as the probable cause of the more general disorder. The results of the more recent active investigations concerning the functions of the thyroid and other ductless glands, and the therapeutic effects of extracts derived from them, add to the probability that the statement we have quoted from Auld will be found correct. That the suprarenal capsules contain true glandular structure, and also an abundance of nerve- ganglia and filaments connecting freely with the abdominal sympathetic system of nerves, was fully demonstrated by Henle and von Brunn.

The existence of a true glandular structure plainly implies a secreting or transforming function, the suspension of which would lead to some kind of metabolic disorder, while the close nervous connection with the sympathetic would explain the coincident gastro-intestinal disorders and progressive asthenia. This pathological view also enables us to see why the clinical phenomena

constituting Addison's disease may be developed, not exclusively by tuberculosis or any one special disease, but by any and every morbid condition capable of persistently interrupting the natural function of the suprarenal bodies.

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Case in which autopsy revealed congenital absence of the suprarenal capsules. No other lesions were found. Only two similar cases reported. Patient was 24 years old; the symptoms were melanoderma, pains, progressive asthenia, wasting, cachexia, and gastro-intestinal disturbance. Ended fatally in ten months. A. Rispal (Third French Med. Cong.; N. Y. Med. Record, Sept. 19, '97).

Well-marked case of Addison's disease in which the adrenals were reduced to their shells of fibroid and fatty tissue, owing to some process of the nature of simple atrophy. Tubercle was conspicuously absent. C. Nixon (Med. Press and Circular, May 12, '97).

Case of typical Addison's disease in which autopsy showed the abdominal lymphatic glands to contain tubercle bacilli, while the advanced caseous degeneration of the adrenals failed to show any. Henry Waldo (Brit. Med. Jour., July 10, '97).

Prognosis.—Until very recently the prognosis in well-characterized cases of Addison's disease has been uniformly regarded as unfavorable. It is true that a very few cases of recovery have been reported, but nearly all writers of the highest authority regard such as examples of mistaken diagnosis. "An absolutely fatal prognosis must always be made. In all these cases which are recorded as having been cured there exists a doubt as to the accuracy of the diagnosis." (Merkel.)

Osler, in 1894, declared that the disease was fatal in every case. In the meantime, encouragement by the results of the use of the thyroid gland or extracts from the same in cases of acromegaly led Oliver and others to use extract of the healthy suprarenal capsules in the treatment of Addison's disease, and with so much benefit that in the second edition of his work, in 1895, Osler had modified his previous declaration by saying: "The disease is *usually* fatal. . . . In rare instances recovery has taken place, and periods of improvement, lasting many months, may occur."

Case of recovery in a man of 57 years who, in April, 1885, was suddenly attacked by weakness, anæmia, pigmentation of the mucous membranes, bronzed skin, and, a little later, pain in the region of the capsules. Strength returned little by little; so that in September, 1886, he was able to pass half an hour out of bed. At the same time the pigmentation grew less marked and gradually disappeared. At the end of two years the patient could be regarded as cured, and recovery has since been maintained. H. Neumann (Deutsche med. Woch., Feb. 1, '94).

As the disease, in a large majority of the cases, has been shown to be tuberculous, there is no reason why some cases may not recover, as well as in some cases of tuberculosis of the lungs or other structures. A very guarded diagnosis, however, is most judicious in all cases of this disease.

Treatment.—The tendency of medical investigators, in the last two or three decades, has been to seek for some one specific cause for each disease and for each a specific remedy. This has caused the careful consideration of the influence of predisposing causes to be more neglected; less attention to be given to the influence of co-operative causes, especially in the production and maintenance of chronic diseases; and less appreciation of the effects of retained excretory products during the progress of diseases, both acute and chronic, and of consequent

changes in therapeutic indications in different stages of progress. In accordance with these tendencies most recent writers have devoted but few words to the consideration of the treatment of Addison's disease. Not being able to identify the specific or essential cause, we are assured that no specific remedy has been found, and that the treatment must be hygienic and palliative,—*i.e.*, we must endeavor to improve nutrition by suitable diet, and to mitigate the more important symptoms as they arise. The truth is, however, that very few chronic diseases arise from, or are perpetuated by, a single specific cause. Contrarily, most of them are readily traceable to the co-operation of several causes, some of which are called predisposing and others exciting factors. And even in the few chronic diseases that have been traced etiologically to a specific exciting cause or pathogenic germ, as tuberculosis of the lungs, it is generally admitted that the specific germ alone rarely proves efficient in developing the disease without the aid of such predisposing factors or conditions as had diminished the natural vital resistance of the system or of the organ attacked.

In the treatment of all such cases, therefore, it is very important that we investigate carefully the history of each patient that we may appreciate whatever predisposing influences had been operative, and execute such measures as will prevent their further influence. In the early stage of Addison's disease the patient should be relieved as much as possible from both hard physical labor and mental anxiety, and given free access to pure air of genial temperature and a fair variety of digestible food.

As the autopsies reported have shown the presence of tubercular degeneration, not only in the suprarenal capsules, but also in other structures in a majority of the cases, patients should be encouraged to go early to mild and dry climates at moderate elevations, and to take persistently such remedies as have been most beneficial in the more common forms of tuberculosis. Of these, perhaps, for protracted use none are better than creasote, in some form, and nuclein, as they are both antiseptic and tonic to the digestive and assimilative organs. If the creasote is given in capsules, $^1/_{30}$ grain of strychnia, added to each dose, will aid in sustaining the functions of the cardiac and vasomotor nervous systems. Arsenic has been strongly recommended in such cases as will tolerate it in large doses without disturbing the stomach and intestines. In one case under my care the patient appeared to derive much benefit from potassio-tartrate of iron, given in moderate doses in connection with digitalis. In the later stage of the disease, when the asthenia is profound, the patient should be kept much in the recumbent position, and his gastric and intestinal disturbances combated by the use of bismuth subnitrate, cerium oxalate, and sometimes creasote with codeine.

Since it has been ascertained by very careful experiments that the healthy suprarenal capsules contain an active substance capable of producing a decided stimulant and tonic effect on the cardiac and other ganglia of the sympathetic nervous system, and of efficiently increasing the vasomotor functions with slow heart-beat and greater blood-pressure, their use in the treatment of Addison's disease has been tested, more or less, by almost every physician having a case under his care. Oliver, who has been most active in investigating the action of preparations of the suprarenal capsules and their value in the treatment

of Addison's disease, says they may be used in the form of alcoholic tincture and of either fluid or dry extract. The best mode of administration is by the mouth, and of the dry extract in the form of tablets of 2½ grains each, one of which may be taken three times a day, and slowly increased to five or six in the twenty-four hours.

Extract or tincture of suprarenal capsules tried in several cases. Good results obtained not only as a means of restoring muscular strength and improving the general condition, but sometimes as a true curative remedy. Maragliano (Riforma Med., Dec. 4, '94); Shoemaker (Univ. Med. Mag., Feb., '95); Lloyd Jones (Brit. Med. Jour., Aug. 24, '95); Oliver (Brit. Med. Jour., Aug. 31, '95).

Extract of suprarenal capsules might be of advantage in the earlier stages of the disease; but, when the solar plexus and the splanchnics are involved, treatment by extracts or tinctures of the adrenals cannot overtake the results of nervous changes. McCall Anderson (Glasgow Med. Jour., Feb., '95).

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Case of a man, aged 44 years, somewhat addicted to alcoholic excesses and subject to occasional attacks of asthma, who, during the months of February, March, and April, developed all the characteristic symptoms of severe Addison's disease. During the month of May he received a subcutaneous injection of suprarenal capsular juice, 1 cubic centimetre every two days. During one month of this treatment his appetite and strength had returned and he had gained four kilogrammes in weight. On the 14th of June he had a violent quarrel with a neighbor, and all his former bad symptoms began to return, and caused his death on the 14th of July. No autopsy was made. Spillmann (Rev. Méd. de l'Est., Jan. 15, '96).

Case of a man, 46 years of age, suffering from pulmonary tuberculosis and Addison's disease with marked pigmentation of the skin and of the mucous membrane of the palate, treated with an extract prepared from the fresh suprarenal glands of the pig extracted and preserved in glycerin. One drachm of the extract corresponded to one suprarenal gland, and the patient at first was given ½ drachm three times a day. This treatment was continued for eight months, and the patient was discharged in a greatly improved state, having gained in weight and strength and the pulse-frequency being much lessened. Four months later the patient was still in good health. William Osler (Inter. Med. Mag., Feb., '96).

Case in which the symptoms were typical and characteristic of Addison's disease. Very great improvement resulted from the administration of suprarenal extract. On careful examination after death both suprarenal capsules were absent, the right being entirely, and the left almost entirely, replaced by fat. Byrom Bramwell (Brit. Med. Jour., Jan. 9, '97).

Forty-eight cases of Addison's disease from literature, which were treated with adrenal gland. Of these, 6 seemed cured, 22 were improved, 18 unimproved, and 2 became worse. In many of the cases there was such a grave tuberculosis of other organs as to preclude expectation of marked improvement. F. P. Kinnicutt (Amer. Jour. Med. Sci., July, '97).

Man of 49, with well-marked Addison's disease, treated with tablets of suprarenal gland, beginning with 10 grains daily and increasing up to 200 grains. At the end of the year the man was entirely well. C. W. Suckling (Brit. Med. Jour., May 28, '98).

Case of Addison's disease with pulmonary tuberculosis. In June, 1897, patient was put upon the extract of suprarenal bodies, taking 2 ½ drachms of glycerin extract and 4 ½ grains of dry extract daily. Symptoms improved, but signs of tuberculosis of lungs persisted, and he was sent to a mountain-resort. In April, 1898, he was much improved, although still expectorating slightly. J. Sellier and H. Verger (Jour. de Méd. de Bordeaux, Oct. 23, '98).

Case of Addison's disease in all respects very typical, and in addition a small phthisical lesion at apex of one lung. He

was given daily 3 3/4 to 12 1/2 drachms of fresh suprarenal glands of beef, veal, or mutton, and also during some part of time hypodermic injections of solution of suprarenals in glycerin and water. For five months there was no obvious improvement. After further lapse of time strength began gradually to return and pigmentation to diminish in intensity, so that finally he was able to resume his employment, and was still at work three years later. Béclère (Semaine Méd., Mar. 2, '98).

Case of Addison's disease treated with the fresh suprarenal gland, with distinct improvement of general health, but pigmentation remained unchanged, and patient died two years later. Hayem (Sem. Méd., Mar. 2, '98).

Grainger Stewart, McCall Anderson, and other observers have reported cases treated with the suprarenal extract without benefit.

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Case of Addison's disease treated with suprarenal extract. Much improvement took place during the first four weeks, after which the failure was rapid until death occurred. Reference to 9 other cases recorded in which improvement had taken place in 5, in 2 no improvement, 1 died early, and 1 continued treatment but a few days. Sydney Ringer and A. Phear (Brit. Med. Jour., Jan. 18, '96).

Typical case in which the patient had been taking suprarenal capsule by the mouth for some time. The only apparent effect was that the temperature, which had been subnormal, had returned to normal. T. R. Bradshaw (Lancet, Oct. 31, '96).

Administration of suprarenal extract in case of Addison's disease caused a disturbance of nitrogen-equilibrium, leading to increased consumption of body-albumins and to loss of weight. Max Pickardt (Berl. klin. Woch., Aug. 15, '98).

Suprarenal capsules administered subcutaneously to a case of Addison's disease; within twenty-four hours patient died with subnormal temperature and great prostration and collapse. P. Courmont (Quatrième Congrès Franç. de Méd. Int., '98).

As it is only about three years since preparations of the suprarenal capsules were first used in the treatment of cases of Addison's disease, it is not yet possible to determine the real value of this treatment, it being well known that a considerable proportion of the cases continue a larger period than three years and often have periods of improvement. And for the same reason it is not possible to determine whether the cases reported as cured will prove permanent or only temporary. Moreover, if the clinical symptoms and conditions constituting Addison's disease result from the interruption of the functions of the suprarenal capsules, there must have been a prior pathological condition causing such interruption. And, while we might reasonably expect the use of suprarenal extract to relieve the pigmentation and asthenia so long as its use was continued, unless it also removed this primary pathological condition, the asthenia and pigmentation would sooner or later return, certainly after the discontinuance of the remedy. The whole subject needs more careful and protracted investigation.

Removal of the diseased adrenal by surgical procedures is one of the latest means employed,—accidentally, it may be said, for the operation in the case reported had been performed for the removal of a malignant retroperitoneal growth that turned out to be a tuberculous suprarenal capsule.

Literature of '96-'97-'98.

Case of recovery after removal of a tuberculous adrenal lying directly on the spinal column and appearing as a small, movable, firm, nodular tumor. Pressure over it brought on a character-

istic attack of pain. The patient recovered in two weeks. All the symptoms disappeared after the operation. Eight months later no evidence of the disease could be discovered. Oestreich (Zeit. f. klin. Med., B. 31, p. 123, '97).

NATHAN S. DAVIS,
Chicago.

ADENITIS.—Gr., ἀδήν, a gland; *itis*, inflammation.

Definition.—Inflammation of a gland.

Varieties.—Adenitis may be *acute*, due almost invariably to infection from an attack of angioleucitis and occasionally to injury or strains; or *chronic*, resulting from either of the preceding, especially in strumous or cachectic persons and from slight sources of irritation, and not uncommonly resulting in permanent enlargement and induration or in tuberculous degeneration.

Adenitis of specific origin will be described under SYPHILIS and URETHRA.

Acute Adenitis.

Symptoms.—The general symptoms depend upon the extent and severity of the infection. Rigors may occur when pus forms. The temperature is frequently elevated. If the infection is severe, symptoms of profound septicæmia appear.

The local symptoms are, by far, the most prominent in the majority of cases, and consist of pain, heat, and swelling. The suffering varies from a slight soreness only to intense pain, according to the position of the gland, its relations with the surrounding tissues, and the density of the tissue in which it is imbedded. The heat may vary according to the degree of the congestion present. The swelling may either be great or slight. If the lesion be confined to the gland, it will be well defined; if periadenitis is present, the swelling will be more or less diffuse. Glands in any region of the body may be affected, but those of the neck, axilla, and groin more than the others; this is due to the fact that infection generally enters the system through the mouth, throat, genital organs, and the extremities.

In the congestive, or exudative, stage, pain and swelling are present in the region of the glands; if the glands are superficial the swelling is ovoid with the long axis coinciding with the direction of the afferent lymphatics, and palpation reveals several movable, hard, elastic, and tender rounded masses.

When the glands are deep, as in the axilla, abdomen, or even the neck, the results of palpation are less definite and satisfactory.

In the suppurative stage the pain increases and becomes sharp and catching, the skin reddens, and the periglandular tissue swells.

If the gland alone suppurates the skin remains normal, while under it may be felt the softened and enlarged gland. This latter opens outwardly or into the neighboring cellular tissue on from the sixth to the fifteenth day of the affection. When the gland opens outwardly, the cicatrix is much smaller than when it ruptures into the cellular tissue, as in the latter case it gives rise to an abscess.

If the cellular tissue around the gland suppurates the skin becomes hot, swollen, and painful, and fluctuation may be felt. Two foci of suppuration are thus established. The skin is occasionally undermined by the pus. Recovery is possible, however, without suppuration of the gland.

Both the gland and the cellular tissue around it may suppurate, either simultaneously, or suppuration of the cellular tissue may precede that of the glands,

or the latter may suppurate and rupture into the surrounding cellular tissue and form an abscess. Pus is usually produced in considerable quantity, and the affection is of long duration.

Suppurative adenitis may result in cicatrization after several weeks. This cicatrix may reopen to allow the exit of pus from a suppurated gland. On the other hand, a fistula may result, which may give exit to sero-pus or to lymph (Desprès). A lymphatic gland or vessel will then be found at the bottom of the abscess-cavity, below the crater-like opening.

As the suppuration usually starts in more than one focus in the gland, the first sensation to the touch will be one of bogginess, which periglandular congestion may render obscure. Well-defined fluctuation is found only when considerable tissue is destroyed.

Diagnosis. — The diagnosis of ordinary superficial acute adenitis is usually easy; it is more difficult when the neighboring cellular tissue is also inflamed; it may be impossible in cases of deep-seated or visceral adenitis.

In adenitis of the inguino-crural region the swelling is found in the external portion of the region if due to a lesion of the gluteal tissues, and in the inner portion of the region if due to a lesion of the anus, perineum, or external genitals. In both conditions the tumor will have its long axis directed more or less horizontally.

The swelling will be found in the lower portion of the inguino-crural region, with the long axis directed more or less vertically, if the lesion causing it is situated on the foot, leg, or lower part of the thigh. This disposition is due to the anatomical relations of the lymphatic vessels and glands, and should be borne in mind. Operation for strangulated crural (femoral) hernia has been performed for an adenophlegmon of the crural canal.

Etiology. — The lymphatic glands serve as reservoirs on the course of the lymphatic vessels, through which any irritants or infection must pass.

Cold and overexertion act as local depressants, and thus may indirectly favor the development of adenitis. General debility has the same effect. The following varieties of adenitis, etiologically regarded, are recognized:—

1. Adenitis by contiguity, resulting from the propagation, by contact, of a neighboring inflammation.

> Three cases of suppurating inguinal glands accompanying gonorrhœa in which a bacteriological examination of the pus showed the presence of gonococci. Pure culture of typical gonococci obtained in one case; on being placed in the urethra of a healthy man this set up a characteristic gonorrhœa. In the two other cases, in which the abscesses opened spontaneously, examination of the pus from the fistulous tract showed the presence of gonococci and streptococci. An attempt to cultivate the cocci on Wertheim's medium, made in one of these cases, failed. Hansteen (Archiv f. Derm. und Syph., vol. xxxviii). (See URETHRA.)

2. Adenitis by continuity or following lymphangitis.

3. Adenitis by embolism, due to the transportation of septic or irritating matter, produced in the system or coming from the outside.

Adenitis of the mesenteric glands may be due to dysentery or to the inflammation of Peyer's patches in typhoid fever.

Adenitis occurs in carbuncle, furuncle, vaccination, erysipelas, and eruptive or infectious fevers.

Pathology.—If suppuration does not occur, resolution may take place, or

chronic enlargement of the gland may follow hyperplasia of the connective-tissue stroma of the gland.

If suppuration does occur the surrounding connective tissue may, and usually does, suppurate; then the more or less disintegrated gland lies in a suppurating cavity formed by the circumjacent connective tissue.

There are two forms of acute adenitis depending upon the degree of inflammation present:—

1. Exudative adenitis. In this form the gland is swollen, and it feels hard and elastic. On section it appears reddish-brown, like the spleen, with small foci of hæmorrhage, all of which indicate excessive dilatation of the capillaries. The lymphatic stream is arrested by the dilatation of the cortical lymph-sinuses and their obstruction by fibrin, granular material, and portions of altered white corpuscles. The lymph-follicles are filled with fibrin and accumulated lymph-cells. The stroma of the gland is swollen and infiltrated with cells.

If the section of the gland is scraped, a milky liquid will be obtained, which contains white corpuscles and epithelial cells, the latter showing several nuclei.

2. Suppurative adenitis. In this variety the gland softens, its tissues become more brittle, hæmorrhagic infiltration centres form that soon change into yellow, purulent foci. These, at first distinctly separate, soon unite, forming an abscess within the fibrous capsule of the gland. Sometimes the periglandular tissue suppurates, while the gland does not.

The glandular abscess and the periglandular abscess may open externally, each one separately or both simultaneously. The suppurating gland may rupture into the cellular tissue. Occasionally the gland is hard and elastic; it may be difficult to separate it from its fibrous capsule. The afferent lymphatics are enlarged and thickened. The lymph-cells and cortical follicles are few in number and have undergone granulo-fatty degeneration.

Literature of '96-'97-'98.

Seven cases of articular rheumatism in which the lymphatic glands situated above the affected joints were swollen and painful, the pain or tenderness increasing with that of the joint-affection. During the attacks some were of the size of a nut and rolled under the finger. No periadenitis or diffuse swelling was present.

In almost every case some previous infectious disease was to be found with which the chronic rheumatism could be connected. Bacteriological examinations, however, carried out either with the intra-articular liquid withdrawn by aspiration or by fragments of glands removed aseptically, gave almost no results. A. Chauffard and F. Ramond (Rev. de. Méd., May 10, '96).

Prognosis.—The prognosis is usually favorable; it may be unfavorable, however, when extensive abscesses form in the neighborhood of important organs.

Deep-seated suppurative adenitis may give rise to dangerous complications, especially in certain regions, like the neck and mediastinum, on account of the purulent extensions (through burrowing) and the difficulty of evacuating the pus.

Ulceration of the great vessels of the neck giving rise to grave hæmorrhages may also occur.

Case, in the practice of Johnston, in which the internal jugular vein was ligated for profuse hæmorrhage, caused by a sloughing adenitis following malignant scarlet fever. L. H. Adler, Jr. (Univ. Med. Mag., Dec., '91).

Treatment.—The first indication in acute adenitis is to remove any source

of irritation or infection. Any wound, abrasion, opening, or any natural cavity with which either of these may connect should be so treated as to bring about absolute local asepsis.

If the case is seen early enough, cold applications should be made to the affected region. Cold inhibits the multiplication of bacteria, but when applied late it favors the death of cells, and should consequently be avoided.

The region in which the affected gland is situated should be kept at rest and, if possible, elevated. In this manner the afferent arterial current is diminished, while the efferent venous and lymphatic currents are increased.

To prevent suppuration gray mercurial ointment, very gently rubbed in, is useful. The injections of from 5 to 10 minims of a 3-per-cent. carbolic-acid solution into an inflamed gland have also proven satisfactory.

Case in which injections of carbolic acid destroyed the tendency of the glands to develop. Schwartz (Revue Gén. de Clin. et de Thér., Mar. 4, '91).

Literature of '96-'97-'98.

In cervical adenitis it is necessary before the skin is altered to treat abscess by punctures with a fine needle and modifying injections. If this method adopted, cure without cicatrix in 99 per cent. of cases. When with general treatment and stay of six months or more at sea-side, gland remains swelled and indurated, neither showing signs of resolution nor advancing toward softening, injections of 1-in-50 chloride-of-zinc solution gives best results. Injection repeated three or four times, at two days intervals, with 30 to 60 drops of this solution. This nearly always leads to commencement of softening, which is finished by injections of camphorated naphthol. Calot (Presse Méd., Oct. 22, '98).

If it is desired to hasten suppuration, warm antiseptic fomentations are to be used in preference to poultices. The compound resin cerate of the pharmacopœia is effective for this purpose, and is antiseptic as well.

When pus has formed the gland should be opened by a generous incision, sinuses, if present, being opened throughout their entire length to facilitate treatment. The contents are then carefully removed, and the infiltrated wall scraped with a sharp curette. The cavity should then be packed with iodoform gauze, or gauze impregnated with camphorated naphthol or salol. The dressing may be removed on the third day.

In the treatment of cases of simple chronic adenitis, applications of iodine, compression, and local blistering have given the best results.

Blisters, nitrate of silver, or iodine tincture should be applied around, but not over, the inflamed gland.

Literature of '96-'97-'98.

In adenitis complicating articular rheumatism the best results are obtained from the tincture of iodine given internally; 100 drops in divided doses are given daily; long continued use is advised. A. Chauffard and F. Ramond (Rev. de Méd., May 10, '96).

Excision may be performed if the mass be large or disfiguring.

1. Whenever fluid—that is, pus—can be detected in connection with a diseased lymphatic gland, the operation should be done before the skin becomes red and thin. 2. When the diseased gland is subcutaneous—that is, not beneath the deep fascia or muscle, and has been completely removed—the least scar will result if neither stitches nor drainage-tube be used, especially if it be possible to leave the wound uncovered by dressing and exposed to the air, so that the edges may be drawn and glued together by drying lymph. 3. If the diseased gland be beneath the muscle or

muscular fascia, then a drainage-tube must be used and the edges of the wound must be united by suture. The best drainage-tube is the gilt spiral wire, especially as it may have to remain from two to eight or ten weeks, according to the depth of the wound or the completeness of the removal of the gland. 4. Where many glands have to be removed, it is better to remove them through a series of small incisions and thereby avoid very extensive ones. All sinuses and suppurating cavities should be thoroughly cleansed by means of scraper and lint, so as to leave a fresh surface free from granulation or decayed or decaying tissue, and that a drainage-exit should be maintained until all the deep parts are healed. Teale (Brit. Med. Jour., No. 1717, '93).

Important to avoid tearing or wounding the gland in removing it, to keep close to its surface in order to prevent hæmorrhage, and to use transverse incisions. W. K. Treves (Brit. Med. Jour., No. 1717, '93).

Electricity, preferably the constant current, is highly recommended by some authors. Daily sittings of ten minutes each, using 5 to 15 milliampères, are required.

Of 19 cases of adenitis (glandular enlargements) treated by electricity (constant current), 7 cases were cured and 5 improved; cured by electrolysis, 3; improved, 2; electrolysis followed by abscesses with cure, 1; failure of treatment, followed by extirpation, 1.

The continuous current slightly accelerates the circulation, and in case of inflammation re-establishes it, provided the red blood-globules be not agglutinated. It also accelerates molecular changes and stimulates the terminal nerve-filaments; so that exudations disappear within the sphere of their distribution. The negative pole is recommended as the most active. That one of the cases improved by electrolysis was tubercular and the glands so treated disappeared is noticeable. An intensity of from 10 to 20 milliampères, for fifteen minutes at each sitting, is advised. Labat-Labourdette (Arch. d'Electricité Méd., Aug., '93).

Codliver-oil, the iodides, and iron are indicated in all cases when the digestive organs do not rebel against their use. Arsenic and strychnine are the agents next in order, and sometimes prove very effective. Out-of-door life and plentiful nourishment are of primary importance in these cases.

Chronic Adenitis.

Symptoms.—The symptoms vary according to the period of development in which the diseased gland is found at the time of examination.

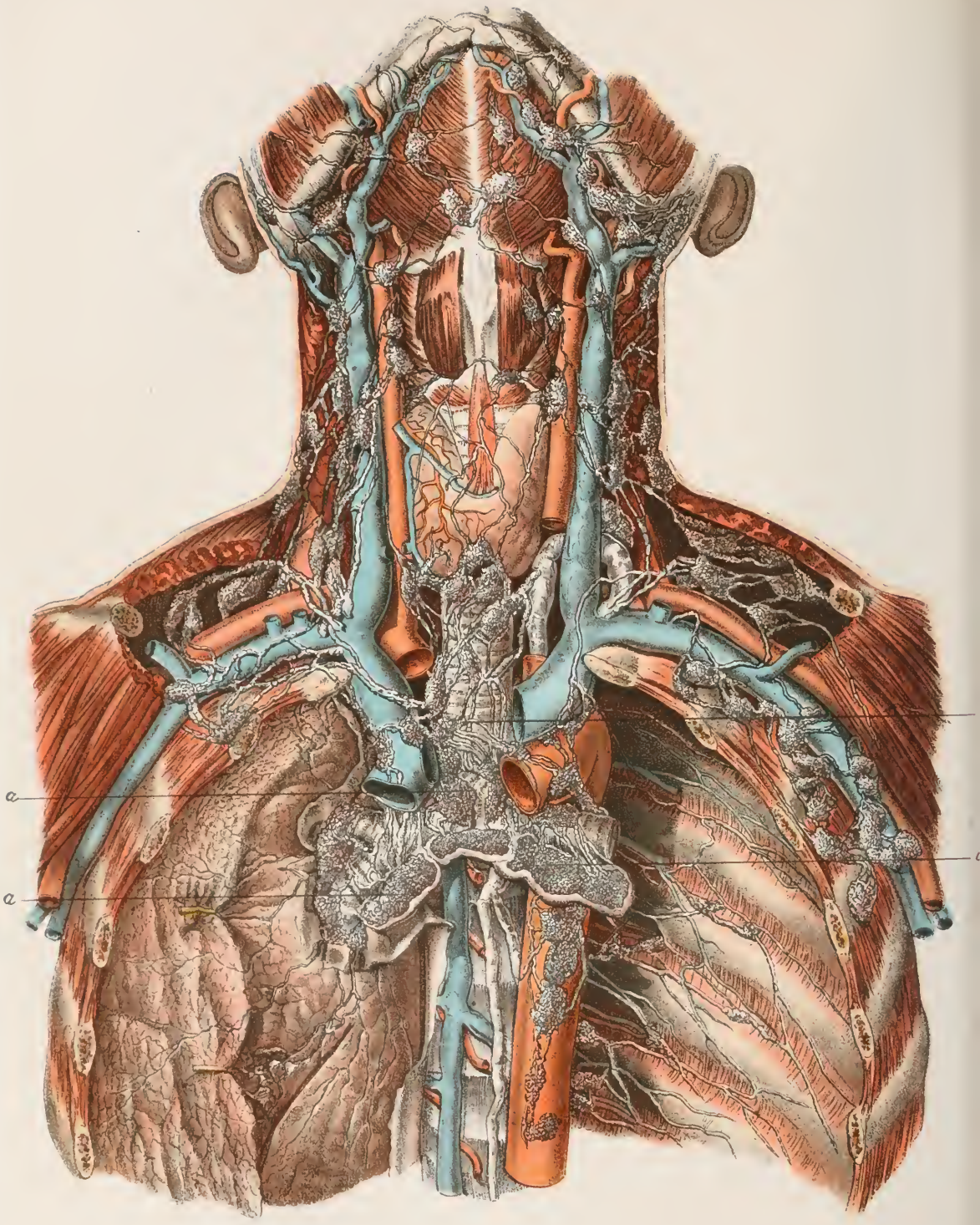
Three periods of development are commonly recognized in tuberculous adenitis: the period of induration, or indolence; the period of inflammation; and the period of suppuration.

1. *Period of Induration, or Indolence.*—This period may last for years, and resolution may even take place, though the gland always remains somewhat enlarged and indurated. The glands are felt as hard, elastic, enlarged bodies, rolling under the finger, with more or less distinctness as they are situated superficially or deep. No heat, pain, or redness of the skin is perceived.

2. *Period of Inflammation.*—In this period we have pain, redness of the skin, and tenderness on pressure. The gland, if solitary, may adhere to the skin. Fluctuation may be present.

3. *Period of Suppuration.*—In this period we notice much more softening of the contents of the gland than a real suppuration. The skin may ulcerate through almost without inflammatory symptoms, and the contents—consisting of caseous matter half-dissolved in a whitish watery fluid—may be evacuated. When periadenitis occurs, true pus may be present.

If chains of glands are tuberculous,



Cervico-Bronchial Lymphatic System (Bourgery.)

a a a a Glands involved in bronchial adenopathy

ANATOMIE DU CORPS HUMAIN

the latter inflame alternately and discharge their contents in the same order, a series of abscesses being thus formed.

When the contents of the gland are discharged, the skin may become ulcerated in the neighborhood, form fistulæ, and a depressed, adherent, violet cicatrix finally form.

In some cases a fistula may form and last for years; the skin may be undermined, and disfiguring cicatrices may be formed.

Cretaceous transformation occurs at times in the deeper glands, but rarely in the superficial ones. Some caseous glands undergo a process which transforms them into a cyst-like cavity containing a serous liquid.

Chronic adenitis may assume various forms.

1. *General Tuberculous Adenitis.*—This presents itself especially in negroes. Organs other than the glands are but little affected, and continuous fever exists. The retroperitoneal, bronchial, and mesenteric glands are the most enlarged. It resembles, in many ways, an acute attack of Hodgkin's disease.

2. *Local Tuberculous Adenitis.*—(*a*) Cervical. This form is usually met with in children, and begins in the submaxillary glands, which are generally more enlarged on one side.

(*b*) Bronchial. This form is thought to be always secondary to a focus in the lungs, by some authors, but this opinion is contested by many others, Osler among them. Local lung-infection, pericardial infection, and general infection are to be feared, however.

(*c*) Peribronchial. In this form we must realize the importance of lesions resulting from caseation. There is a softening of the lymphatic glands situated around the lower end of the trachea and main bronchi. Evidence from percussion is of doubtful value; alterations in breath-sounds are much more important, especially when unilateral; divided respiration, with prolonged expiration, is found unaccompanied by any adventitious sounds. In cases in which the enlarged glands ulcerate through the air-tubes, the breath has a very offensive odor, and co-existence of fœtor with hæmoptysis and evidence of pulmonary consolidation are suggestive. When vomiting of blood and its passage by the bowel is added, the diagnosis of glands rupturing into bronchus and œsophagus is the most likely one. The annexed *colored plate* distinctly shows the anatomical relations of the peribronchial glands.

(*d*) Mesenteric. This form may be primary, and is thus very common in children, or secondary to local intestinal tuberculosis. The sufferers are usually weak and wasted; the abdomen is enlarged and tympanitic, and diarrhœa is a common symptom. Some fever is usually present. This form may exist in adults. (Osler.)

> The majority of children presenting symptoms of tuberculosis also have general adenitis, the swollen glands being felt everywhere; they never change in size or consistence. Suddenly a bronchitis develops, followed by a bronchopneumonia, from which the child dies. Microscopical examination reveals caseous spots and the presence of tubercle bacilli throughout the affected glands. The name of "generalized peripheral adenitis" suggested for this condition. Grancher and Marinescu (L'Union Méd., Dec. 2, '90).

Diagnosis.—Chronic adenitis is generally limited to one or two glands; when the glands are tuberculous, chronic adenitis is apt to affect an entire mass. The former is often associated with an external simple lesion; the tuberculous

form is apt to be more frequent in children, young soldiers, and negroes.

Lymphadenoma. — This variety of tumor is usually more voluminous and is not suppurative. The diagnosis, however, is exceedingly difficult.

Simple Adenitis.—This is an acute affection usually ending in a few days in suppuration.

Syphilitic Adenitis.—When a primary sore is present, numerous small, hard, indolent glands can be felt if the region is supplied with a chain of lymphatics. When in secondary syphilis there is glandular enlargement, a large number of external lymphatics take part in the process.

Carcinoma.—The enlarged glands are small and hard, and can generally be distinctly traced to the growth.

Lymphosarcoma. — This persists longer and is much larger before degeneration occurs.

> Polyadenitis is a diagnostic sign of tuberculosis in children. Marinescu (Revue Men. des Mal. de l'Enfance, Mar., '91).
>
> [As observed some years ago by Hutinel, the majority of children presenting symptoms of tuberculosis also have general adenitis. The swollen glands are to be felt everywhere, forming a general adenitis, and are found in regions where there is no other trace of tubercular involvement. Suddenly a bronchitis develops, followed by broncho-pneumonia, from which the child dies. Ernest Laplace, Assoc. Ed., Annual, '92.]

In chronic adenitis the glands may become painful by the compression of small nerves, or of neighboring organs; when they are inflamed a small, hard mass usually appears, either alone or united with others, which may become enlarged and suppurate, or persist with practically no change for years, or finally disappear if the cause of irritation be removed.

Chronic adenitis is frequently a complication of malignant tumors. Supraclavicular adenitis appearing during the course of visceral cancer is usually situated on the left side (found twenty-seven times on that side by one author). It may be solitary or accompanied by adenitis in other regions; it usually appears late and develops rather rapidly. When occurring early it may be very useful for diagnostic purposes.

> Twenty-nine cases of visceral cancer in which supraclavicular adenitis was present on the left side in twenty-seven. The symptoms are not very decided at first and the diagnosis may be more difficult. As to the pathogenesis, it must be looked upon as due to direct propagation or to the formation of a cancerous embolism. H. Rousseau (Paris Thesis, '95).

From a clinical point of view this adenitis may be known by its ligneous hardness, its painlessness, its freedom from adhesions, and by the union into one solid mass of all the glands forming it.

Etiology.—This form of adenitis frequently follows some neighboring superficial lesion, such as eczema, impetigo, conjunctivitis, or the exanthemata. Catarrhal inflammation of the mucous membranes predisposes to tuberculosis of the glands. The resistance of the lymph-tissue is weakened. This explains the frequent development of tuberculous bronchial adenitis after whooping-cough and measles, and of mesenteric adenitis in children with intestinal disturbances.

Cervical adenitis is not a manifestation of an already generalized tuberculosis; the bacillus penetrates—by solution of continuity of the mucous membranes or the skin—to the ganglion, which becomes a seat of infection. (Duhamel.)

A distinction should be made between

hereditary (congenital) and acquired tuberculosis. In the latter case the author's views seem rational and correct, being comparable with and analogous to the phenomena observed in carcinoma and syphilis. When the infection is acquired there is, at first, a local seat, or focus, of infection in which the disease-germs develop and from which, after proliferation, they spread until the disease becomes more or less generalized, —the germs being transmitted through the lymphatic system to the lungs and thence in the blood-stream to the various organs of the body; the various glands along the course or path of transmission become affected and in turn become additional possible foci of infection. On the other hand, when the trouble is hereditary the glandular manifestation is an indication of an already generalized tuberculosis.

Youth predisposes to caseous adenitis on account of the predominance at that period of the lymphatic system. Crowding, humidity, and bad or insufficient food are also predisposing factors. Tuberculous adenitis is frequently observed in temperate regions. Negroes brought to such climates are especially prone to become sufferers.

The absorbent power of the lymphatic system is so great that the morbific principle of tuberculosis may be transported to the glands without visible external lesion of the skin or mucous membrane.

Axillary adenitis is frequently secondary to chronic tubercular lesions of the lungs. (Lépine.)

The cervical glands are occasionally found affected in phthisical patients.

> Proof of this has been lacking, and experimental attempts to induce tuberculosis of the cervical glands by introduction of tubercle bacilli into the tonsils have failed. J. Solis-Cohen (Amer. Jour. Med. Sci., May 9, '95).

> In post-mortem examinations upon bodies of twenty-five tubercular patients tuberculosis of the tonsils was found in twelve, in every case in which the lymph-glands of the neck were also affected. Kruckmann (Virchow's Archiv, B. 138, '94).

> A considerable proportion of the cases of enlargement of the tonsils and of adenoid vegetations of the pharynx are tuberculous in nature. Dieulafoy (London Practitioner, July, '95).

> A suppuration of cervical glands may be derived from the pharynx, as a rule, without tuberculous lesion of that part. Eustace Smith (London Lancet, May 25, '95).

> Instance of tuberculous inoculation through a small wound on the chin by kisses of tuberculous mother. In this case cutaneous tuberculosis was followed by a tuberculous lymphangitis. Rémy (Jour. de Clin. et de Thér. Infantile, Mar. 14, '95).

> [If the mother were tuberculous, there is a reasonable doubt that her offspring was a "healthy child," as stated in the original article. C. Sumner Witherstine.]

Pathology.—Usually an entire group of glands is affected. The glands are isolated when the irritation and rapidity of growth are not great; this usually occurs in secondary visceral adenitis. In other cases—especially when the glands are superficial, where the adenitis is primary—the glands are united into a large lobulated and irregular mass, the size of which may vary from that of a small nut to that of an orange.

If the adenitis follows a visceral tuberculosis the afferent lymphatics show, in some cases, signs of tuberculosis, as is the case in pulmonary and mesenteric tuberculous meningitis.

Two varieties of lesions are to be noted: 1. Lesions of chronic adenitis affecting the stroma and the elements of the gland, which becomes hypertrophied. 2. Specific lesions of tuberculosis, consisting in miliary granulation at

first, ending in caseation. As one or the other of these two processes is the more prominent, so will the lesion vary in appearance. Deep adenitis is never so sclerous as the superficial variety, the latter being characterized by a more vigorous reaction.

On section of a gland in the early stage of tuberculous infection we find it redder than usual, though at times gray and somewhat translucent. The tuberculous granules may be perceived by a glass. They are formed from the vascular and lymphatic vessels found in the cortical and medullary portions, and resemble ordinary follicles, but contain many small cells. Caseation rapidly occurs in them, beginning at the centre of the cells, where giant-cells are first formed, proceeding to coagulation-necrosis and caseation. A number of these granulations united form the small, yellowish masses, which may be seen by the unaided eye. Caseation is due to vascular obliteration.

The small, yellowish masses, softened at their centres, are surrounded by fibrous tissue due to sclerosis of the stroma of the gland. When this tissue gives way, several masses form a large collection of yellowish, softened material resembling putty. Calcification may occur when the process is very slow.

The specific lymphadenitis blocks the lymph-spaces and thus, for a time at least, mechanically prevents the bacilli from penetrating into the general circulation. Glands not in the stream become infected, this probably being due to the transportation by migrating cells of the motionless bacillus. However, infection usually takes place in the direction of the lymph-current. As the lymph-spaces are obstructed by inflammation products, and entrance of fresh bacilli into the gland is thus prevented, it is the multiplication of those already entered into the gland which gives rise to the tuberculosis. When caseation occurs, nearly all the bacilli have disappeared, but the spores remain, and are capable of reproducing the disease. Suppuration is due to a secondary infection by pyogenic micro-organisms. (Senn.)

The virus of tubercular adenitis is less potent, for the caseous material of a lymph-gland kills guinea-pigs, while rabbits escape, the latter being less susceptible to tuberculous infection.

Taken as a whole, tuberculous adenitis (*a*) is a local disease which may frequently undergo (*b*) spontaneous resolution, but which (*c*) frequently tends to suppuration, the pus being nearly always sterile. It is, however, a constant danger to the system.

Chronic adenitis may, in some cases, be due to continued irritation; ulcers; chronic lesions of the skin or mucous membrane of the bones; periosteum; articulations; chronic inflammation of the viscera; and certain new growths where the adenitis is purely irritative and not yet specific.

Literature of '96-'97-'98.

Researches on the relation existing between caries of the teeth and simple chronic and tuberculous adenitis in children. In 41 per cent. of the children examined no etiological factor for cervical adenitis found except concomitant dental caries. Caries of the teeth to be looked upon as relatively the most important cause of cervical adenitis in children. H. Stark (Beit. z. klin. Chir., vol. xvi, No. 1. p. 61, '96).

Prognosis.—A chronic adenitis may end in resolution, suppuration—caseation (see PATHOLOGY), cretaceous formation, or cyst-formation. If all the tuberculous matter can be eliminated, either by nature or art, a recovery may

be obtained. The deeper glands are more dangerous than the superficial, as they are extirpated with more difficulty. The great danger of local tuberculous adenitis is that it may give rise to other tuberculous lesions, either *local* (pulmonary phthisis, tuberculous osteitis, white swellings, or abscesses) or *general* (generalized tuberculosis, with rapid death).

Acute miliary tuberculosis may be caused in two ways: either by conveyance through the lymphatic system until the venous system is reached or by the perforation of a vein and the entrance of tuberculous material. (Weigert.)

Treatment.—The general treatment should receive considerable attention. Good food, country air, and sea-bathing are of the greatest value.

> The sea-shore advised for a short time, not longer than two months,—after which tuberculous children fall back into their previous condition from loss of appetite. Iscovesco (La Semaine Méd., Sept. 17, '90).
>
> Aëropathy and salt-water baths are useful in the treatment of local tuberculosis. The children are in the open air all day, playing on the beach. A climate of mild temperature should be selected, one allowing patients to partake of the baths surcharged with chloride of sodium the year around. Of eight patients suffering with Pott's disease, coxalgia, and scrofulous glands, six were cured. The others improved in the course of a few months. François Hue (La Normandie Méd., Apr. 15, '91).

In peribronchial adenitis the same general methods are to be resorted to. When due to tuberculosis and kindred diatheses and uncomplicated by fever or involvement of lung-tissue, the sea-shore or the country is indicated. At the seaside children should not bathe in the sea, and should be as quiet as is consistent with life in the open air. Brisk frictions, milk, a nutritious diet, and iodotannic syrup (2 to 4 teaspoonfuls per day) are effectual measures. After three to four weeks, emulsion of calcium lactophosphate and codliver-oil should be given. Counter-irritation between the shoulder-blades favors the curative action of the other remedies (Marfan). Applications of tincture of iodine between the shoulders, or in some cases blisters or, even better, ignipuncture, will fulfill the latter indications. Iron-iodide syrup, iodotannic syrup, iodine tincture, potassium iodide, or large doses of codliver-oil, either alone or with cinchona-wine, arsenic or arseniate of sodium are the standard remedies usually recommended in these conditions. Not much is to be expected from them, however, unless out-door life is insisted upon.

Literature of '96-'97-'98.

> Alterative effect of cordial of codliver-oil (Hagee), internally, a tablespoonful three times a day, very marked in case of chronic adenitis with otorrhœa. William C. Botelar (St. Louis Med. Era, Apr., '98).
>
> Every case of cervical adenitis coming under observation tested. Tuberculin used was 1-per-cent. solution of Koch's original product. If in from six to twenty-four hours after injection there occurred weakness, sensations of heat and cold, general malaise, nausea, anorexia, severe headache, pain in back and limbs, and if these symptoms were sharply defined in both their beginning and ending, reaction was considered to have occurred. All cases were practically without fever at time of injections. No bad results followed. In only one case was reaction excessive. It generally occurred in from 8 to 14 hours after injection and continued from 12 to 36 hours. From 1 to 5 milligrammes constituted usual dose. On 29 cases there were positive reactions in 18 and doubtful in 2. In 6 of 11 cases in which there was no reaction glands had been enlarged only for from 1 to 3 weeks. In majority of positive cases they

had existed for six months or more. Of the 29 patients studied 22 were females. In 17 patients diseased glands were on left side. General and local treatment advised in positive cases, local treatment consisting in excision of glands when possible, or free incision and drainage when suppuration has taken place. Edward O. Otis (Phila. Med. Jour., July 16, '98).

Extirpation is recommended, but the possibility of giving rise to a tuberculous process elsewhere by facilitating absorption through exposed tissues should be borne in mind.

Senn states that early operative interference is as necessary in the treatment of tubercular adenitis as in the treatment of malignant tumors, and holds out more encouragement, so far as a permanent cure is concerned. Tillmann argues that glandular tuberculosis should be operated as soon as possible, in order to prevent general miliary tuberculosis by the passage of the bacilli into the system.

If forced to limit himself to one method of treatment, the author would select incision; still, every case must be judged on its merits and treated accordingly. Treves (London Lancet, Sept. 14, '89).

Extirpation is indicated when internal medication has failed; when glands involve the face and produce deformity; when they are isolated and not numerous; when they have undergone fibrous degeneration; when they are not freely suppurating. It is contra-indicated when there is impaired general health and tubercular deposits in the lungs and joints; when ramifications of glandular chain are very extensive. Le Dentu (Revue Int. de Méd. et de Chir., Sept. 10, '95).

Immediate excision of infected glands in tubercular inguinal adenitis advised. Brault (Lyon Médical, No. 10, '94).

[To be of real value extirpation must be done before infection has extended beyond the glands involved, else the infection will proceed, nevertheless, to generalization. When done later, it may prevent that secondary infection which follows from an overswollen or suppurating gland, and may be of cosmetic value, —that is, to prevent unsightly and extensive scars. C. Sumner Witherstine, Assoc. Ed., Annual, '96.]

1. Whenever fluid—that is, pus—can be detected in connection with a diseased lymphatic gland, the operation should be done before the skin becomes red and thin. 2. When the diseased gland is subcutaneous—that is, not beneath the deep fascia or muscle, and has been completely removed—the least scar will result if neither stitches nor drainage-tube be used, especially if it be possible to leave the wound uncovered by dressing and exposed to the air, so that the edges may be drawn and glued together by drying lymph. 3. If the diseased gland be beneath the muscle or muscular fascia, then a drainage-tube must be used and the edges of the wound must be united by suture. The best drainage-tube is the gilt spiral wire, especially as it may have to remain from two to eight or ten weeks, according to the depth of the wound or the completeness of the removal of the gland. 4. Where many glands have to be removed, it is better to remove them through a series of small incisions and thereby avoid very extensive ones. Considering the subject from a pathological point of view, all sinuses and suppurating cavities should be thoroughly cleansed by means of scraper and lint, so as to leave a fresh surface free from granulation or decayed or decaying tissue, and a drainage-exit should be maintained until all the deep parts are healed. Teale (Brit. Med. Jour., No. 1717, '93).

After incision, thorough curetting followed by iodoformization and closure should be performed. The wound should be drained. The operator should not only feel, but see, every gland he removes. In cervical adenitis an S-shaped incision gives more room and a better cicatrix. (Senn.)

In other regions the incision should be made so as to bring its axis parallel with

the cutaneous folds. Local recurrence should be treated in the same way. Three or four operations in as many years have been performed by Senn on the same patient, with final successful result.

One thousand cases of extirpation of tuberculous glands, without a single case of pyæmia or septicæmia and only two cases of erysipelas, in both of which the infection was traced to a nurse. One of the best criterions of the success is the ever-increasing number of patients who present themselves for operation, and who nearly all enter the hospital asking for the removal of their enlarged glands. Milton (St. Thomas's Hospital Reports, vol. viii).

Out of 335 children treated the tuberculous glands were removed in 102. The operated cases gave a percentage of 83.34 cured, and the non-operated 68.77 per cent.; that is, 14.56 per cent. in favor of the operation. Generalization of the disease could be found only in 1 per cent. of the cases. Cazin (Lyon Méd., Jan. 11, '90).

Five hundred and six cases: 286 operated; 220 medically treated. Of the operated cases 149 were carefully followed during three years; 93 (62.4 per cent.) have not shown the least sign of return of the affection. In the remaining 56 cases there was a return. Of the 149 non-operated cases, 28 died in sixteen years (18 per cent.) from general tuberculosis, and 14 are still alive, but have developed pulmonary tuberculosis. Von Noorden (Schmidt's Jährbücher, July, '90).

When many glands are involved and suppuration has occurred, or when periadenitis is present, excision is not to be recommended, as extensive connective-tissue infiltration renders it impossible to remove all the infected tissue. Subcutaneous extirpation may be resorted to, but the method allows of but imperfect evacuation of the glandular contents and can hardly be recommended.

Subcutaneous extirpation. Incision at the nape of neck, beginning on a level with the external auditory meatus, 1 centimetre from hairy border, and passing with a slight convexity downward 5 centimetres backward, downward toward the median line. Dollinger (Cent. f. Chir., No. 36, '94).

Drainage of the abscess is a measure which may be recommended for many reasons. A small incision is sufficient for all purposes, and there is practically no scar left.

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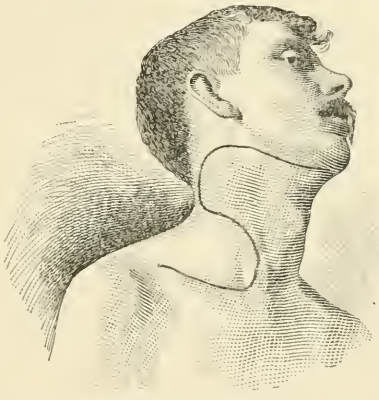
Removal should not be resorted to until there is positively no further



Sigmoid incision for the removal of cervical glands. (*Senn.*)

chance of a cure by absorption. Excision of cervical glands is not a satisfactory operation. Out of some forty cases treated, but two scarred necks from the "cannula treatment": the use of a small, self-retaining, drainage cannula, personally devised and shaped like a glove-stretcher. The skin-cut is barely three-eighths of an inch in length: just long enough to admit the cannula, which, upon being inserted, is pushed in until its joint is reached. By closing its outer arms, the ends within the abscess separate. It is then retained within the cavity, dilating the tissues in the vicinity of the cut and giving good drainage through a minimum cut. It should be left in place from twenty-four to seventy-

two hours, but usually two days are sufficient. The shorter the time it is left in, the better the result. In the average case healing follows in from five to seven days. F. M. Briggs (Boston Med. and Surg. Jour., Dec. 3, '96).

Less radical measures sometimes bring about a cure. A transformation of the tuberculous tissues into a sclerotic mass may be obtained. A solution of chloride of zinc injected about the tuberculous foci excites a growth of new fibrous tissue, which encapsulates the diseased portion.

Twenty-three patients suffering with joint and gland tuberculosis treated in this manner. Fibrous-tissue formation occurred in every case. Injections made of 2 to 5 drops of a 10-per-cent. solution of the zinc chloride, and often repeated Lannelongue (Le Bull. Méd., July 8, '91).

Solutions of iodoform and ether, after Verneuil, in cases where operative procedures are indicated, give a lasting cure, without a cicatrix. These injections seem to exert a beneficial action, not only on the tuberculous glands treated, but also on those at a distance from the seat of the injection.

Impure glycerin always contains a certain amount of formic acid. In the treatment of tuberculosis by the iodoform-glycerin injections the irritating properties of the formic acid may have some share in the curative effects of iodoform emulsions. Iodoform itself in the body is converted by oxidation into formic acid and hydriodic acid. When oxidation is sufficiently active to decompose it, iodoform is more effective than when oxidation is feeble. Hence formic acid added to iodoform emulsions should be effective. Favorable results where iodoform has proved ineffective. In cases of tuberculous adenitis and in one case of tuberculous arthritis of the ankle-joint formic acid used alone, the formate of soda in solution being injected. Excellent results obtained. Senger (Deutsche med. Woch., No. 17, '91).

Camphor-naphthol has proved valuable in some cases.

It is claimed in favor of camphor-naphthol that there is no danger of intoxication and that the treatment is almost painless. Ménard and Calot, however, have reported cases of intoxication following injection of camphor-naphthol into abscess-cavities. The patient suffered from frequent rapid pulse, loss of consciousness, and epileptiform attacks. The quantity of the drug injected was about 6 drachms. This patient recovered. In another case, 8 years of age, $1\frac{1}{2}$ ounces of the solution were injected. In the third case, aged 12, 5 drachms. In the last two cases life was saved by freely opening the cavity and washing it out on the first appearance of toxic symptoms.

When the tuberculous glands are deeply situated and accompanied by a fistula, the results of camphorated naphthol are not so marked as when the glands are soft and more superficial. Nélaton (Le Bull. Méd., July 2, '93).

Camphorated naphthol recommended (1) for dressings, (2) in cases of recurrence after excision, (3) in cutaneous gummata of the face, and (4) in subjects with an inoperable tuberculous mass. In the last cases the injections gave a result not obtainable by any other method. Moty (La France Méd., July 9, '93).

Camphorated naphthol is prepared and used as follows:—

℞ Betanaphthol,
Camphor, of each, 10 parts.
Alcohol (60 per cent.), 40 parts.

A few drops are to be antiseptically injected here and there throughout the mass of indurated glands. Courtin (Jour. de Méd. de Bordeaux, May 17, '91); Nélaton (La Semaine Méd., Apr. 1, '91).

Of 47 cases 28 were cured and 19 improved. Reboul (Marseille-médical, Jan. 30, '91).

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Solution of lactic acid recommended as a parenchymatous injection, beginning with weak solutions of not more than 15- or 20-per-cent. strength, and gradually increasing to 35- or 40-per-cent. strength. A 15-per-cent. solution of the lactic acid alone generally causes considerable suffering, but when combined with from 2 to 5 per cent. of carbolic acid it causes but little pain. Twenty or 30 minims of the solution injected, then withdrawn after a few minutes, repeating in a week or two. E. F. Ingals (Inter. Med. Mag., June, '96).

Interstitial injections, frequently recommended, usually fail or cause suppuration, owing to the fact that the tincture of iodine is employed. Metallic iodine, however, gives a better result.

Metallic iodine has a special affinity for tuberculous glands. Eight or ten applications usually insure cure, provided the cavity is filled with crystals. Guermonprez (Gaz. des Hôp., June 25, '95).

Tincture of iodine, introduced by electricity (cataphoresis), is sometimes effective when the glands are not large. The negative pole of an ordinary galvanic battery is covered with chamois-skin, over which is fitted an ordinary hard-rubber cap, to prevent evaporation. Ten drops of tincture of iodine are poured on the chamois-skin. This pole is applied directly to the tumor, and the positive pole at some indifferent point. Six cells are switched in use for eight minutes. After two minutes a distinctly metallic taste can be perceived in the mouth, due to the presence of iodine, and showing that the medicine has permeated the system. Much improvement has followed this mode of treatment. Haye (Va. Med. Monthly, Oct., '91).

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ADENOID VEGETATIONS. See Naso-pharynx.

ADENOMA. See Tumors.

ADHATODA JUSTICIA.—The leaves of this plant (syn., *Adhatoda vasica*, *A. gendarussa* or *pubescens*) contain an alkaloid, vasicine; and an acid, adhatodic acid. An infusion was found by Hooper to be poisonous to insects and animalculæ, but harmless to the larger animals.

Dose.—The powdered leaves, 10 grains. Tincture (2½ drachms of dried leaves to the pint), ½ drachm.

Therapeutics.—Adhatoda has been employed with marked benefit in asthma (Jayesingha), cigarettes of the leaves being smoked, while either of the other preparations is taken internally.

ADHESOL.—Adhesol is the name given by Dufan to a limpid fluid, amber in color and of an agreeable odor, which is neither toxic nor caustic. Applied to the surface of the skin it evaporates in a few minutes, leaving a transparent elastic covering, and when applied to the mucous membrane a very adherent layer. The substance is prepared as follows: 11 ounces of copal resin, 1 ounce of benzoin, and 1 ounce of balsam of Peru are left to macerate for two days in a mixture of 3¼ ounces of ether and 5 drachms of essence of thyme. It is then filtered and ¾ drachm of naphthol added.

ADIPOSIS. See Fatty Heart and Obesity.

ADONIS.—Adonis is a ranunculaceous plant, closely related to the anemone, growing wild in Europe, Asia, and Africa. Several species of adonis are employed,—*Adonis vernalis*, *A. æstivalis*, *A. capeusis*, *A. cupaniana*, and *A. amurensis*,—but all seem to possess the same properties, although the several varieties are variously employed in the different countries in which they grow. In Russia, for instance, it has long been employed in cardiac diseases, and in Africa

as a substitute for cantharides, the bruised leaves, when fresh, possessing vesicating properties.

Dose.—An infusion of 4 to 8 parts of the plant in 200 of water may be given in tablespoonful doses three or four times a day (Huchard). The tincture may be administered in doses of ½ to 1 drachm. Adonidin, a glucoside of adonis, is administered in doses varying from $^1/_{20}$ to $^1/_{10}$ grain. It acts more promptly than digitalis. (H. C. Wood.)

Physiological Action. — Adonis resembles digitalis in its action upon the heart. It increases the cardiac energy and gives rise secondarily to an increase of arterial tension. The increased contractions eventually diminish and a period of quiet follows, varying in duration with the dose administered.

Cervello isolated a glucoside from *Adonis vernalis*,—adonidin,—a yellow powder having a bitter taste, obtained from the leaves. It is soluble in water and alcohol, but insoluble in ether or chloroform.

Inoko also obtained a glucoside—adonin — from the Japanese plant, *Adonis amurensis*. This substance is free from nitrogen, amorphous, colorless, of a bitter taste, and soluble in water, alcohol, and chloroform. The symptoms observed on the heart of a frog were precisely those seen when digitaline is used. It is about twenty times weaker than the adonidin obtained from the European *Adonis vernalis*.

Adonis Poisoning. — In poisonous doses adonis paralyzes the peripheral extremities of the vagus, tends to excite the accelerator system, and it finally produces paralysis of the cardiomotor nerves.

Therapeutics.—Adonis is useful in cases of uncompensated heart affection in which grave circulatory disorders exist. The marked diuretic powers of the drug causes it to be of value in cases of dropsy and fatty heart. It is also valuable in palpitation dependent upon irregular inhibition and in aortic and mitral regurgitation (Oliver, Wood). As it does not seem to possess cumulative tendencies, it may be administered with more freedom.

> Adonis vernalis used in thirty-three cases. It will sometimes succeed where digitalis has completely failed, but it is often not given in sufficiently large dose. Case illustrative of the tolerance of large doses of the infusion. Boy-Teissier Marseille-médical, Mar. 30, '88).
>
> Adonis employed in a large number of cases of different cardiac disorders. One drachm to one ounce of the infusion daily constitutes an excellent cardiac tonic. In fatty degeneration of the heart it increases diuresis and regulates the circulation. In many cases of heart disease the drug is effective when digitalis is useless or injurious. F. Borgiotti (Deutsche med.-Zeit., Aug. 30, '88).

Obesity.—As a remedy for the reduction of superfluous adipose tissue, adonis æstivalis has proved of value. Owing to the fact that it does not possess a tendency to cumulation, it may be continued for a long time.

> Case in which the patient weighed 342 pounds and suffered severely from dyspnœa when the administration of adonis was begun. After taking 10 drops of the tincture three times daily for twelve days there was a loss in weight of 17 pounds, the respiration had become easier, and there was general euphoria. R. Kessler (Amer. Medico-Surg. Bull., Aug. 15, '94).

Epilepsy.—To reduce the active cerebral hyperæmia present during a paroxysm, adonis has been recommended, owing to its power of stimulating the vasoconstrictors. It may be advantageously combined with the bromides.

Several years of the use of adonis vernalis have shown its ability to cause almost immediate cessation of the fits in some cases. Bechterew (Neurol. Centralb., Dec. 1, '94).

AGALACTIA.—From α, priv., and $\gamma\alpha\lambda\alpha$, milk.

Definition.—Absence of the mammary secretion after parturition. The term is generally understood as meaning defective lactation, especially as to quantity.

Symptoms.—Absence of the mammary secretion after labor is rarely observed. The appearance of milk may be delayed days and even weeks, but evidence of functional activity usually appears, although frequently the quantity secreted is insufficient or the quality of the milk is not of a character to afford sufficient or proper nourishment to the infant.

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Statistics of 126 lying-in women in the obstetrical wards of the Halle clinic from February to May, 1895, inclusive. Out of the 126 cases, 83 (or 65.9 per cent.) had sufficient milk when discharged between the tenth and twelfth days. Buchmann (Centralb. f. Gynäk., No. 25, '96).

Deficiency of secretion may occur from the start and continue throughout the entire period of lactation, or it may be normal in amount at first and gradually diminish.

Etiology.—Heredity is a prominent factor in case of true agalactia. Puech has reported the case of a woman who had given birth to thirteen children, but whose breasts, though normal, had never yielded milk. Her mother, who had given birth to twenty-three children, had likewise been absolutely sterile as regards the secretion of milk.

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Case of complete agalactia in a woman, aged 25, primipara, whose mother is living and in good health, having borne 9 children, 3 of whom are now living; 4 died at about five years of age, 1 at eight, and 1 at twelve months. The patient is the eighth child, and says her mother has often told her that in none of these puerperia had she any milk, although the breasts were natural in appearance. The patient has one married sister, who at 25 years gave birth to a full-term child, and she never had a drop of milk for her baby. J. Ives Edgerton (Med. News, Feb. 6, '97).

General ill health in which anæmia plays the leading rôle is the most frequent cause of retarded, defective, or imperfect lactation. Lack of confidence, on the part of the mother, of her ability to nurse; excitement, fatigue, highly-spiced food, overfeeding, and insufficient sleep may be mentioned as the most frequent auxiliary factors.

Injudicious dressing whereby the mammæ are compressed, the pressure interfering with their circulation and proper nutrition, is a frequent cause of deficient lactation. Advanced age, especially in women who have suffered frequently from miscarriages, may also be included among the etiological factors. The habit of weaning early or avoiding lactation tends to cause atrophy of the breasts and to repress the lacteal secretion.

Prolonged suckling, specific affections, and iodide of potassium are also considered as causes of mammary atrophy, and, therefore, of deficient lactation powers.

Intercurrent affections, especially when acute, frequently arrest the flow of milk. High fever, when temporary, usually causes diminution of the secretion for the time being, and it may act as the primary factor of gradual cessation.

Pathology.—When there is total absence of mammary secretion, both

breasts are usually affected. When the secretion is only defective, the involvement of the glands in the pathogenic process local or general, is usually unequal, one mamma being less productive than the other. Large breasts, owing to the quantity of adipose tissue present, are more likely to be agalactic than the smaller and thinner ones. The ducts and glands are usually found deficient in number and size, while the adipose tissue or the fibrous stroma is unduly abundant.

Treatment.—The first indication is to carefully inquire into the cause of the condition. In the majority of cases there is general deficiency in the performance of metabolic processes due to general physical apathy. The patient should, therefore, be provided with nutritious food and appropriate tonics, especially strychnine, which is peculiarly effective in these cases.

The bowels should be regulated by proper dieting and massage or exercise rather than by laxatives, and it is highly desirable that there should be at night uninterrupted sleep for six hours for mother and child.

Galactagogues are valueless in the majority of cases, most of them exerting practically no influence upon the gland. Occasionally a slight stimulating effect may be noted, but this lasts only a short time, and the organ soon lapses into its former torpor.

Beer, ale, porter, and other malt liquors, especially alcoholic beverages, are more hurtful than beneficial, and what improvement may show itself is due mainly to the confidence in the beverage taken, through the agency of autosuggestion. The quantity of milk may be increased, but its quality is compromised, especially when poor beer is consumed by the mother. It encourages the production of fat at the expense of the casein or milk-sugar. Pure malt may be substituted with great advantage.

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It is an error to suppose that stout or porter improves milk. Another error is the belief that beef-tea and chicken-broth are good for nursing mothers. Angel Money (Austral. Med. Gaz., Jan. 20, '97).

Somatose exercises a specific effect upon the mammary glands of nursing mothers; it produces an ample secretion of the mother's milk, and causes the ailments occurring during nursing to disappear quickly. The dose consists of 1 teaspoonful in a cup of warm milk, soup, cocoa, etc., from three to four times a day. Felix Heymann (Deut. med.-Zeit., Nos. 59, 63, '98).

Probably the most satisfactory among the galactagogues is jaborandi. The fluid extract or the tincture may be given in ½-drachm doses. The active perspiration and salivation produced are objectionable, however, while the effects of the remedy are not lasting.

Case where the administration of 10 drops of the fluid extract of jaborandi every four hours to a patient whose milk had ceased for a fortnight effected a re-establishment of the secretion. The patient, however, soon began to suffer from extreme nervous excitement with delusions. On stopping the jaborandi the nervous and mental symptoms disappeared and also the secretion of milk. Waugh (Lancet, Dec. 24, '87).

Castor-oil leaves have always borne considerable reputation. A decoction is made by boiling well a handful of them in 3 to 4 quarts of pure water. The breasts are bathed with this decoction for fifteen to twenty minutes. Part of the boiled leaves is then thinly spread over the breast and allowed to remain until all moisture has been removed from them by evaporation, and probably, in some measure, by absorption. The

procedure is repeated at short intervals until the milk flows upon suction by the child, which it usually does in the course of a few hours. (Routh.)

Galega is credited with galactagogue properties, ½ to 1 drachm of the dried leaves being administered daily.

Electricity sometimes proves effective. A mild current (3 to 5 milliampères) is passed through each breast after carefully wetting the sponges in salt water and applying them on each side of the gland. By changing the position of the electrodes, every minute or so, to a neighboring spot, all the acini may be traversed by the current during a sitting of ten minutes. The applications should be made every two or three hours. A strong current is more hurtful than beneficial. Artificial suction with the breast-pump and massage are greatly used. The extract of thyroid gland has recently given very satisfactory results.

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Nine cases showing the value of thyroid-gland extract as a galactagogue, the object being to increase the activity of the metabolic processes. In one of the cases the administration of four tabloids was sufficient to restore the lacteal secretion, which continued as long as the tabloids were regularly taken. Neglect of the tabloid caused the milk to fail. In six cases the milk-supply returned in three days and became plentiful. In two, no influence on the milk observed, the patients being delicate, nervous, and worn out. R. R. Stawell (Intercolonial Med. Jour., Apr. 20, '97).

As to the diet, it should be as generous as the patient can digest. There is little to be gained by the common practice of prescribing two or three extra meals a day. The milk-supply as well as the general health of the woman will depend more upon what she digests and assimilates than upon the amount of food taken into the stomach. Three daily meals with, at most, a single liquid meal at bed-time, will generally be better than five or six. Milk should constitute a portion of the dietary. The difficulty in digesting milk, of which many patients complain, is, for the most part, imaginary. If taken as a part of the meal and not in addition to it, it will, as a rule, be well borne. Frequently patients who cannot use cold milk can take it hot without difficulty.

The secretion of milk is said to be greatly diminished by fatty food. A vegetable diet reduces the proportion of butter and casein and diminishes the sugar. A meat diet has the opposite effect. Systematic nursing with strict observance of stated intervals is essential for its influence upon both the quantity and quality of the milk-secretion. (Charles Jewett.)

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AGARICIN.—Agaricin is obtained from white agaric. It is a white, crystalline powder, soluble in alcohol, and but slightly so in cold water and ether. Agaricic acid, the pure active principle of agaricin, is generally used.

Dose.—The dose of agaricic acid is $^1/_6$ to $^1/_2$ grain, administered in pills. Hypodermically its effects are more active and the dose should be one-half smaller.

Physiological Action.—The physiological effects of this drug are not known, but they are supposed to resemble those of pilocarpine, or to act mainly upon the nervous supply of the sweat-glands.

Agaricin checks pathological sweating, not by a central action, but by directly influencing the glands themselves. In this only does it resemble atropine. Small doses, $^1/_3$ to ½ grain,

preferred to a single large dose. The action is slow, but lasts a long while. Hofmeister (Archiv f. Exp. Path. und Pharm., vol. xxv, '89).

Therapeutics.—Agaricin is especially valuable in the treatment of the night-sweats of phthisis. If the gastric digestion is good, it will be well tolerated and produce its effects in from two to six hours. Administered before retiring, it sometimes acts as a preventive of the exhausting perspiration attending advanced cases. It is not effective in all cases, however. (Hare, Butler.)

Seventeen cases in which agaricin was found to possess most excellent anti-sudorific properties, the effect being pronounced not only in tuberculosis, but in other forms of poisoning and infection. This agent, even in the third stage of pulmonary tuberculosis, was able to suppress the distressing night-sweats, its action being manifested in from two to six hours after the ingestion of the drug and lasting about six hours. No evil after-effects of any kind were observed. The dose employed was from $^1/_3$ to $^1/_4$ grain in pill form. Combemale (Bull. Gén. de Thér., May 30, '91).

Sweat is always decreased, thirst and the excretion of the urine are diminished, the functions of the lungs and skin are not interfered with, and there are no bad effects. The administration of pure agaricic acid greatly lessens the danger of vomiting and purging. The subcutaneous injection of the soluble sodium salts should not be used, as violent inflammation may follow. W. T. Thackeray (Chicago Med. Jour. and Examiner, June, '89).

Good effects of agaricin in checking the sweats of phthisis. A single pill at night containing about $^1/_{20}$ to $^1/_{16}$ grain, combined with $^1/_{25}$ grain of Dover's powder, as recommended by Lauschmann and Jonng, to reduce laxative properties of the drug. A. Radcliffe (Therap. Gaz., June 15, '88).

One-eighth grain at bed-time, repeated every two to four hours through the night, if necessary, gives very gratifying results in the night-sweats of phthisis. In several instances it succeeded where atropine failed. Cases treated exceeded one hundred. A. B. Pope (Therap. Gaz., Jan. 15, '88).

Literature of '96-'97-'98.

Agaricin most successful of all drugs in combating night-sweats in phthisis. Its active principle, agaricic acid, may be used in $^1/_4$ to 1-grain doses. Method of administering which has given most excellent results is as follows: Give $^1/_2$ grain at first dose and follow with $^1/_8$ grain every four hours until the sweating is checked, then continuing its use—but lengthening the interval—until the smallest quantity necessary to control sweating is reached. Rufus D. Boss (Amer. Therap., Mar., '98).

Minute doses are sometimes as effective as the larger ones and had better be tried before resorting to the full doses.

Agaricin in pill form, in doses of $^1/_{12}$ grain at bed-time, or given late in the afternoon and repeated in four or five hours, was the most successful of all the drugs used in the night-sweats of pulmonary tuberculosis. Conkling (Brooklyn Med. Jour., July, '94).

AGATHIN.—Agathin is salicylalphamethylphenylhydrazone, and is obtained by the interaction of salicylic aldehyde and alphamethylphenylhydrazin. It occurs in the form of a greenish-white, crystalline substance, odorless and tasteless, insoluble in water, soluble in alcohol and ether, and having a melting-point of 74° C.

Therapeutics.—Although agathin was recommended by Rosenbaum, Lagner, and Lowenthal in neuralgia and articular rheumatism, it has failed to hold its position, and has been pretty generally discarded.

Antineuralgic and antirheumatic action of agathin tried. Four grains given three times a day gradually increased to 7¾ grains five times in twenty-four hours. Results not encouraging. Of

eight patients only one was cured on the fourteenth day. In articular and blennorrhagic rheumatism the results also negative. The untoward symptoms were frequent and varied. Most of the patients complained of cephalalgia and a feeling of heaviness. Insomnia, vomiting, diarrhœa, smarting pain during micturition, sensation of heat, and intense thirst were also observed. Agathin should be rejected as an analgesic, and its use may cause dangerous symptoms. Ilberg (Deutsche med. Woch., No. 5, '93).

Agathin found of no value in a case of sciatica, as well as in one of chronic muscular rheumatism. L. Badt (Deut. med. Woch., No. 15, '93).

AGRAPHIA. See Aphasia.

AILANTUS.—Ailantus, or Chinese sumach, is a simarubaceous tree growing in Asia. The powdered bark and leaves and an extract are employed in medicine.

Dose.—The dose of the powdered bark or leaves is about 6 grains; that of the fluid extract, 15 to 30 minims.

Therapeutics.—Ailantus is mainly used as a remedy for tænia solium, being preferred to the other remedies generally employed, owing to its comparatively mild effects upon the general system. The fluid extract has also been employed in the treatment of spasm. (Pike.)

AINHUM.—African word meaning "to saw off."

Definition.—Ainhum is a disease occurring exclusively in negroes and consisting in the spontaneous amputation of the little toe by an adventitious fibrous band.

Symptoms.—The first indication of the disease is a furrow on the lower surface of the little toe, and occasionally other toes, at the proximal interphalangeal joint. This furrow, the result of the circumferential pressure exerted by a fibrous ring, gradually deepens until the bone is reached, this process taking several years, sometimes as many as ten. The distal portion of the toe becomes greatly hypertrophied, then finally drops off, the stump healing without further complication in the great majority of cases. It does not give rise to much suffering, owing to its very gradual progress. It is sometimes mistaken for leprosy.

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Ainhum is an affection apart from leprosy. Cases of circular constriction in leprosy are exceedingly uncommon, are always located on the fingers, and are always accompanied by other morbid manifestations, which indicate a more or less intense infection of the blood by the virus or a localization of the affection in the nerves, the skin, or the mucous membrane. H. de Brun (Bull. de l'Acad. de Méd., Aug. 25, '96).

Etiology.—Ainhum is always observed in negroes, especially of the western coasts of Africa and South America. A number of cases have also been reported in the United States by Bringier. Hindoos are said to also suffer from this disease. Self-mutilation has been suggested by some observers, but the likelihood of this cause is very slight. Heredity does not seem to play any rôle in its production.

Pathology. — The lesions observed have been hypertrophic thickening and retraction of the derma, with consequent atrophy of the underlying bone (Hermann, Weber, Wucherer, Schüppel). It has been confounded with congenital amputation, but, as stated, ainhum is never congenital. That the disease bears some connection with leprosy is insisted upon by some authorities.

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In all cases of true ainhum undoubted symptoms of leprosy are present. It should be looked upon as an attenuated form of the latter disease. Its relations to scleroderma are explained by the fact that this latter affection is a special form of leprosy. Zambaco Pacha (Bull. de l'Acad. de Méd., July 28, '96).

Treatment.—Surgical measures alone prove of value in these cases. Early section of the fibrous ring is sometimes sufficient to arrest the progress of the disease or division of the skin down to the periosteum on the opposite of the seat of disease may be resorted to.

Case successfully treated by dividing the skin and all the tissues down to the periosteum, on the side opposite to the seat of the disease. Murray (Lancet, Jan. 30, '92).

AIROL.—Airol is a compound of dermatol and iodine discovered and introduced by Lüdy as a substitute for iodoform. It occurs as a tasteless and odorless powder, unaffected by light, and containing 44.5 per cent. Bi_2O_3 and 24.8 per cent. of iodine; its color is gray-green, but moist air or the discharge from a wound rapidly converts it into a red substance, with liberation of iodine. It is insoluble in ordinary reagents, but readily dissolves in strong caustic soda or weak mineral acids.

Preparations and Dose.—The powder is employed in the same manner as iodoform in the treatment of superficial lesions.

It has also been used dissolved in glycerin, but Aemmer has recently shown that the poisonous effects of the drug were thus increased.

Bruns, of Tübingen, recommends airol paste as an ideal dressing for sutured wounds. It dries rapidly and adheres closely; it is powerfully antiseptic, and absolutely unirritating to the most sensitive skin; but its chief advantage is that it permits the secretions to ooze through it. He has used it for six months, especially after laparotomies, herniotomies, and ignipunctures, and did not observe an instance of stitch-hole suppuration with it. He concludes that occlusion with airol paste furnishes the simplest means of obtaining healing by first intention. His formula is: Airol, mucilaginous gum arabic, glycerin, of each, 10 parts; bolus albus, 20 parts. He employs it even in wounds with drainage.

Airol Poisoning.—The untoward effects of airol were recently shown in a case treated by Aemmer: after using injections of iodoform-oil without benefit in an abscess resulting from hip disease, this surgeon evacuated the pus and injected 9 drachms of a 10-per-cent. emulsion of airol in equal parts of olive-oil and glycerin. The immediate effects were acute local pain, headache, and coryza; but three days afterward symptoms of bismuth poisoning supervened: fœtid breath, blackish line on the gums; swelling, tenderness, and ulceration of the lips, gums, and pharynx interfering with mastication and deglutition; headache, anorexia, nausea, and prostration. To relieve these symptoms, which were becoming more serious, it was necessary to open the abscess and remove the emulsion of airol. The patient rapidly grew better, but a slate-colored pigmentation of the buccal mucous membrane persisted for a month. Aemmer has found that a certain quantity of airol is dissolved by glycerin, and that intoxication is, no doubt, favored thereby. It is, therefore, better not to use glycerin in combination with airol. Goldfarb has also drawn attention to the fact that applications of airol are sometimes very

badly tolerated. Zelenski found that its use on a burn was followed by intense pain and the formation of large bullæ containing yellow fluid, and that a suppository containing 3 grains of airol introduced into an anal fistula caused suffering comparable to the red-hot iron.

Therapeutics. — The delay in the growth of organisms produced by airol is slightly greater than that resulting from iodoform, and infinitely more than the effect of dermatol. It is found that the influence of antiseptic powders is greater the earlier their use is commenced; in acute phlegmonous processes, however, they do but little good, while the more chronic the inflammation, the better the results obtained; whence their special indication in tuberculosis. The two great advantages in this respect which airol has over iodoform are: first, the fact that a small quantity of its iodine is liberated as soon as it comes in contact with the tissues, and, secondly, that the presence of bismuth exercises a powerful desiccating influence upon the secretion, thereby greatly aiding antisepsis.

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Two thousand cases treated with airol not one of which showed sign of bismuth poisoning. Airol gauze (20 per cent.) also employed as a dry dressing. Its value is particularly striking in superficial lesions, such as ulcers and burns. In tuberculous abscesses the form employed is a 10-per-cent. emulsion in equal parts of glycerin and water. It is extremely bulky, being four times as light as iodoform, and twice as light as dermatol. Haegler (Brit. Med. Jour., Apr. 24, '97).

Powdered airol dusted into the eyes is valuable, particularly in post-operative infections. Wherry (Brit. Med. Jour., Jan. 15, '98).

Disorders of the Skin.—It is in this class of affections that airol is most effective. In ulcers, eczema, and intertrigo its beneficial influence has been conspicuous. Leprosy has recently been added to the list. One case, however, is hardly sufficient to warrant much confidence.

Literature of '96-'97-'98.

Airol is especially useful in ulcers of the leg, particularly those with free secretion, and in the moist dermatitis and eczema that often surround these ulcers. In recent excoriations, cutaneous and other wounds, and in panaritium, and the like, it is very useful, and satisfactorily takes the place of iodoform, over which it has the advantage of being odorless and of being comparatively cheap. No dermatitis or poisoning from its employment has as yet been noted. Hahn (Aerzlichen Praktiker, No. 13, '96).

Brilliant results in intertrigo, both of the secreting and of the pruriginous type. Powdered over the affected parts it gives immediate relief, soothing pain, subduing itching, and healing excoriations. The burning feeling is replaced by an agreeable sense of freshness. L. de Sanctis (Gazz. d. Osp., Nov. 1, '96).

Remarkable improvement in a case of typical leprosy of five years' standing, consequent on the use of airol dusted on the ulcers and open abscesses, together with a 10-per-cent. vaselin ointment applied to the conjunctivæ and injected into localities where softening had commenced. Tonics were also prescribed and general massage practiced. The drug was well borne, but the gums became discolored by the bismuth in the airol, and, when very large doses were given, a certain degree of prostration was observed. Fornara (Lancet, July 3, '97).

Diarrhœa.—Airol has recently been tried by Italian physicians in the treatment of diarrhœa, the alterative properties of iodine and the antiseptic action of bismuth having suggested its employment. The effects seem to have been satisfactory.

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Results of the administration of airol in 11 cases of diarrhœa. The dose given varied from 3 to 12 grains in the twenty-four hours. No ill-effects were noted, even when given for several days. Good results were speedily obtained in indigestion diarrhœas. Venuti and Barbagallo (Canada Lancet, Nov., '97).

In 9 instances of pellagrous intestinal disease, airol, in 5- to 8-grain doses, frequently repeated, gave excellent results. Not only its astringent properties should be mentioned, but its iodine content appears to be responsible for the greater part of its good effects. F. Cerato (Gaz. degli Osped. e delle Clin., No. 142, p. 1502, '98).

Suppurative Processes.—In conditions accompanied by the destruction of tissue by suppuration—boils, carbuncles, etc.—airol seems to be entitled to recognition as a valuable remedy.

Literature of '96-'97-'98.

Airol tried in a large number of cases. In boils the discharge ceased in two days; cure was complete in five, at longest. In carbuncle, with redundant granulations after incision, the latter were replaced by healthy granulations in four days and cicatrization was complete in eight. In a case of otitis media the discharge disappeared in four days. Tausig (Wien. med. Presse, Oct. 11, '96).

Gonorrhœa.—The known value of bismuth in the treatment of catarrhal disorders of mucous membranes due to local infection and the alterative effect of iodine tend to support the claims of airol as an effective remedy for gonorrhœa.

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Four cases of gonorrhœa completely cured after three to five injections of an airol solution. The anterior urethra is first washed with a boric-acid solution. Two and one-half drachms of the following solution are then injected:—

℞ Airol, 30 grains.
Glycerin, ½ ounce.
Water, 75 minims.

This procedure is repeated four or five days in succession. Legueu and Levy (Revue de Thér., May 15, '96).

Special attention called to the value of a 10-per-cent. emulsion of airol in glycerin as injection in gonorrhœa. Used in three cases of acute and three of chronic gonorrhœa, all of which have recovered in ten to fourteen days after three to ten injections, never repeated more often than once daily. No toxic effects were observed. Tausig (Wien. med. Presse, Oct. 11, '96).

ALANGINE.—Alangine is the active principle of *Alangium lam.* It is amorphous, very bitter, soluble in alcohol, ether, and chloroform, and absolutely insoluble in water; it is precipitated in crystalline salts by the mineral acids, and by acetic, tartaric, and oxalic acids. An alcoholic solution being allowed to evaporate, the alangine is deposited in the form of a yellowish, amorphous substance, similar to varnish. Alkalies being added to an acid solution of this alkaloid cause its precipitation in white flakes. It is also precipitated by the ordinary reagents of alkaloids.

Therapeutics.—The bark of the alangium, in doses of 45 grains, is an excellent emetic; in small doses it acts as an antipyretic. It may replace ipecacuanha, except in dysentery. (Mohideen Sheriff.)

ALBUMINURIA.—From Lat., *albumin*; and Gr., *ουρειν*, to pass the urine.

Definition.—The presence of albumin in the urine. Albuminuria may be *true*—when the albumin is dissolved in the urine—or *spurious*, when caused by admixture of semen, pus, or blood in the urine. Spurious albuminuria is easily distinguished from the true form by the aid of the microscope. Both

kinds of albuminuria may occur simultaneously.

Domenico Botugno discovered, in 1770, that urine may contain albumin; by boiling a sample of urine he found that pure albumin was precipitated. It was long maintained by all authors that albuminuria has always been a symptom of disease, but of late many authorities have admitted that albuminuria may be compatible with perfect health.

Posner maintains that albumin is always found in the urine, but normally in too small quantity to be revealed by the ordinary reagents. To demonstrate the presence of albumin in normal urine Posner evaporated large quantities of urine at low temperature and tried the different reagents in the concentrated urine. His experiences have been repeated and his views supported by Senator and by Leube, who, however, did not find albumin in all cases. Von Noorden, Winternitz, Lecorché, Talamon, and different other authors do not admit that albumin is a constituent of the normal urine. At any rate, only traces of albumin can be considered as physiological.

Different kinds of albumin may be present in the urine; generally the proteids contained in the blood-serum are to be found,—viz.: (1) the serum-albumin, or serin, and (2) the globulin, or paraglobulin; in most cases both these proteids are present, but in varying proportions. In some cases there may also be found (3) hemialbumose, or propepton, a mixture of different albumoses which are not precipitated by boiling; (4) nucleo-albumin, which has also erroneously been called "mucin"; and (5) pepton. The urine may, of course, also contain albumin in connection with hæmaturia and hæmoglobinuria, but such cases cannot be classed as true albuminuria.

Physiological Albuminuria.—Regarding the origin of the albumin in the urine only guesses can be made; two theories are possible: (1) the albumin may come from the glomeruli; (2) from the tubular epithelial cells.

Formerly the opinion predominated that the fluid which escaped from the glomeruli was albuminous, but that the albumin was absorbed during the passage through the healthy renal tubules, diseased tubular epithelium being unable to absorb the albumin. This has not been proved, however, and most modern authors believe that albumin is not contained in the urine coming from the glomeruli, except when these are diseased or when the pressure of blood in the glomeruli is abnormally great. Runeberg, on the contrary, is of the opinion that albuminuria is caused by low pressure of blood, and supports this opinion by experiments with animal membranes, but experiences with dead membranes cannot be regarded as conclusive for the action of the living kidney.

Von Noorden and different other authors regard the tubular epithelium as the unique source of albuminuria. These epithelial cells are subject to successive disintegration,—when this is minimal and successive traces, only, of albumin are found in the urine, the albuminuria is physiological; when the decaying of the tubular-epithelial cells is augmented and quickened by disease, a morbid albuminuria takes place. In his opinion, this theory is supported by the fact that nucleo-albumin, of which the protoplasm of the cells undoubtedly is the source, is always found in normal urine.

From a pathological point of view the

causes of albuminuria may be divided into three groups: 1. Disturbances of circulation. 2. Changes of the tubular epithelial cells or of the walls of the blood-vessels of the kidney. 3. Changes in the composition of the blood.

1. All disorders of circulation causing a venous renal congestion will increase the blood-pressure in the capillaries of the kidney, and may thus give rise to a transudation of albuminous liquid; when the congestion is very great the urinary tubules may even be compressed and the escape of the urine rendered difficult. When this is the case and when, also, the supply of arterial blood is diminished, the tubular epithelium will be damaged, and the first result of all this is albuminuria. It is very improbable that arterial congestion ever produces albuminuria, although the experiments of Munk and Senator tend to prove the contrary.

Literature of '96-'97-'98.

Functional albuminuria may be regarded as due to vascular changes and as explainable by the mechanical theory. A temporary condition of anoxæmia, whether due to either arterial or venous obstruction, induces albuminuria, through diminished cell-activity and vitality. Results of experiments performed upon healthy kidneys prove that albumin is secreted by epithelial cells of glomeruli, in capsule of Bowman, and that retardation of blood-current through the vascular plexus of glomeruli is an essential condition; also that anoxæmia of blood-current of the tuft causes albuminuria. J. C. Young (Med. Examiner, July, '97).

2. Changes of the tubular epithelia and the walls of blood-vessels of the kidneys may, as already stated, be due to disorders of circulation, but they may also be caused by different poisons and toxins. When albuminuria is chiefly caused by degeneration of the tubular epithelia, their protoplasm dissolves in the urine, and nucleo-albumin in great quantity is contained in it, combined with serum-albumin and globulin.

Literature of '96-'97-'98.

Urinalysis of 400 cases of variola, showing that albuminuria is met with in 95 per cent. of cases, 32 per cent. having abundant albumin. The albuminuria is subject to marked oscillations in amount, and may be absent on certain days. The maximum amount is usually present at the beginning of the febrile period, less commonly during suppuration and desiccation. The albumin often appears in considerable amount when solid food is first taken and when the patient is allowed to get out of bed. Albumin was present in the urine in 75 per cent. of the cases during convalescence, usually in very small amounts. As a general rule, there was abundant albumin in the severe cases. There is no such thing as a distinctive albuminuria of convalescence. The albuminuria is due to a lesion of the kidneys, this lesion being of either the interstitial form or of the epithelial form. Some chronic lesion of the kidneys practically always persists, being, however, extremely slight, as a rule, and causing practically no symptoms. F. Arnaud (Revue de Méd., May 10, '98).

Albuminuria accompanying lithæmic attacks can only be due to irritation or delicate kidney-structures of child, resulting from attempt at elimination from blood of poisonous and irritating products which are causes of lithæmic attacks. Not infrequently small quantity of albumin found in infants and children suffering from acute lithæmic attacks. Autointoxication is responsible for this albuminuria either in early or late life. In middle or later life it is due to arteriosclerosis developed by this autointoxication. Comparative infrequency of lithæmic albuminuria in late childhood and early adult life is due to better developed and more resisting structure of kidney and to the fact that arterial changes found in old lithæmics have not yet had

time to develop. Rachford (Pediatrics, July 1, '98).

Toxæmia of pregnancy is that condition which occurs as the result of presence in excess of toxic material; so far as is known, the poison is of the nature of an alkaloid or alkaloids. The excretion of waste-material is mainly effected through the kidneys, and this may account for the albuminuria of pregnancy, rather than mechanical pressure or reflex spasm. Kynoch (Brit. Med. Jour., May 21, '98).

Conclusions of previous researches on subject of albuminuria during pregnancy: 1. In most pregnant women there is a certain degree of autointoxication; this is the normal toxæmia of pregnancy. 2 In lesions or disease of the kidney or liver the toxic condition becomes aggravated and may lead to grave complications, notably uræmia. 3. Toxæmia of renal origin is the most common, associated with albuminuria and œdema. 4. Albuminuria is not the cause of eclampsia, but a symptom owning a common origin. 5 Grave complications — such as coma, dyspnœa, and paralysis—may prove fatal in the absence of eclampsia. 6. In most cases toxic eclampsia breaks out in albuminuric women; albuminuria is therefore an important precursory sign which should not be neglected. 7. Personal statistics show that 1 pregnant woman in 40 is albuminuric, and that of 4 albuminurics 1 develops eclampsia; eclampsia without albuminuria is rare—1 case in 9—and is less serious. 8. Albuminuria alone without eclampsia has often serious or fatal consequences—in 110 cases, 8 women and 20 children died; there were 61 premature labors, 8 post-partum hæmorrhages, and 3 cases of threatened convulsions. 9. Albuminuria should be looked for in all pregnant women. 10. Every albuminuric pregnant woman should be actively treated, a milk diet being the best. 11. In case of threatened danger premature labor is indicated, and gives excellent results. Charles (Jour. d'Accouchements, Apr. 3, '98).

3. When the composition of the blood is altered the urine, very often, will be albuminous. This can be proved experimentally by injecting egg-albumin, soluble casein, hæmoglobin, etc., into the veins of animals, for generally the quantity of albumin excreted after the injection will exceed the injected quantity. Similar results may be obtained by the injection of pepton and propepton, whereas the albuminates are generally inoffensive. Ingestion of a very large quantity of egg-albumin is liable to provoke albuminuria.

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Fifty-five cases of nephritis, either chronic or subacute, with albuminuria, in which the hæmoglobin and specific gravity of blood and amount of albumin excreted in urine per day were estimated. There is more or less constant relation between the degree of hydræmia and the amount of albumin excreted. The blood of women is, on an average, about 2.12 lower in specific gravity than the blood of men. The hydræmia bears no relation to the hæmoglobin, but varies inversely as the specific gravity of the blood. No definite relation appears to exist between the hydræmia and the dropsy; but it seems as if there must be some etiological relation between the albuminuria and the hydræmia. Geza Dieballa and Ladislaus von Ketly (Deut. Archiv f. klin. Med., Sept. 6, '98).

Semmola has tried to prove that albuminuria is always caused by changes of the blood characterized by abnormal diffusibility of its proteids, and, in his opinion, the pathological changes in the kidneys are consecutive to the albuminuria. Though his theory is not generally accepted, Rosenbach has adopted it for the albuminuria which is not caused by nephritis, and regards it in such cases as a salutary and regulating process.

In most clinical cases different causes are simultaneously in action, and it is generally very difficult to determine which is the preponderating etiological factor.

Although albumin is not recognized as a normal constituent of the urine, it is, nevertheless, a fact that traces of albumin, and even a rather considerable amount of it, may be found in the urine of persons otherwise healthy and presenting no symptoms of disease of the kidneys or of the organs of circulation.

Literature of '96-'97-'98.

Case of intense, continuous albuminuria of seven years' duration in an apparently healthy man, 67 years of age, who, seven years before, because of a little disturbance of appetite, had consulted a physician, of whom he learned that his urine contained both sugar and albumin. There was no hereditary taint, no previous illness, no alcoholism or syphilis, that could in any way account for the urinary findings. The most careful examination failed to reveal any lesion in any organ. Dieulafoy, who examined the patient, did not look upon the case as one of Bright's disease, but as a sort of diabetic albuminuria which can be regarded as an exaggeration of physiological albuminuria. M. de Crésantignes (Jour. de Méd. de Paris, p. 125, '96).

Many clinicians therefore admit that albuminuria may be regarded, in some cases, as physiological; this is, however, contested by as many.

Virchow described a physiological albuminuria in infants, occurring in the first days of life, and explained it by the sudden changes of circulation taking place immediately after delivery.

Fleusburg and Sjöquist have recently proved that albuminuria regularly occurs in the first days of life, and that the urine also contains an extraordinary quantity of uric-acid crystals; probably the albuminuria is then owed to the irritation of the kidneys caused by these crystals. Ebstein and Nicolaier have experimentally shown that, when the kidneys are forced to excrete a surplus of uric acid which cannot be dissolved, but goes to the bottom in the form of crystals, the urine commonly contains albumin and sometimes even blood.

Gull found a certain form of physiological albuminuria in adolescents about the age of puberty, especially in weak and pale individuals. Other authors, among whom is Quain, have noticed that this condition is frequently associated with masturbation.

Physiological Albuminuria and Life-insurance.—The question of physiological albuminuria in adults has been much discussed during the past few years and has particularly engaged the interest of the medical men employed in insurance-work.

Statistics of life-insurance, etc., showing that physiological albuminuria is met with in America in 2 per cent.; in England in 3 per cent. Privations, scanty food and clothing, unsanitary surroundings, cold bathing, severe physical exercise, and mental strain frequently give rise to albuminuria. Shepherd (New Eng. Med. Monthly, '89).

There is at present a tendency to underrate the importance of albuminuria in life-assurance. While the possibility of ephemeral and unimportant attacks in adolescents is undoubted, the presence of albuminuria in persons of over forty years is very significant. F. de Haviland Hall (Brit. Med. Jour., Feb. 20, '93).

Albuminuria, natural or artificial, never occurs except as the result of pathological changes in the kidney, and is consequently never normal or physiological, and is never to be regarded without distrust. Millard (N. Y. Med. Jour., May 9, '91).

The presence of albumin in persons over middle age of exceeding importance, especially the variety of albuminuria in which, with a low specific gravity, the quantity of albumin present is only to be perceived with the greatest care. This form is indicative of gout of the kidney: a form in which the disease might advance to such an extent as to threaten the life of the patient, though

the merest trace of albumin might be present in the urine. If properly treated with a non-nitrogenous diet and warmth to the surface, these cases might go on for years. Lauder Brunton (British Med. Jour., Feb. 20, '93).

It is necessary, especially in women, to take steps to ascertain that the albumin in the urine is not of extravesical origin. One frequent cause of the presence of albumin in the urine of females is hæmorrhagic endometritis. Routh (Brit. Med. Jour., Feb. 20, '93).

Necessity of having the patient urinate in the presence of the examiner, in order to prevent the substitution of other urine. Mackenzie (London Lancet, June 16, '94).

Instance where a special examination of a case was referred to author by the medical officers of a prominent life-insurance company with a mere trace of albumin in the urine. He sought and found other evidences of a renal involvement, and advised strongly against the risk; another company accepted the risk for $10,000, and, before the second annual premium, the patient died. Purdy (N. Y. Med. Jour., Feb. 28, '91).

Insured patients who presented albuminuria died more rapidly than those in whom no albumin could be found. Theodore Williams (London Lancet, June 16, '94).

Quite young subjects who have albuminuria should be considered as below the average. Douglas Powell (London Lancet, June 16, '94).

Albuminuria is not always pathological; and, if albumin be not found at the second or third examination, the case should be recommended for acceptance. Symes Thompson (London Lancet, June 16, '94).

Two or three examinations at intervals of a week to be made: the patient then waits three months; if the albuminuria still persists, rejection. Crosby (London Lancet, June 16, '94).

Literature of '96-'97-'98.

In cyclical albuminuria the prognosis is generally admitted to be good, although it is commonly assumed that the kidneys in such cases are specially vulnerable. If this be so, it is remarkable that the occurrence of fevers, even scarlet fever, does not produce a notable increase in the amount of albumin. The contrary may, in fact, occur, as in one of Keller's cases, in which the amount of albumin was actually diminished during an attack of scarlet fever, the favorable influence of rest in the recumbent attitude more than counterbalancing the unfavorable influence of the febrile attack. Editorial (Practitioner, June, '97).

Physiological albuminuria believed to be due to ingestion of a greater amount of albumin than the individual can perfectly oxidize, result being excretion of albumin. The habit of overeating is usually associated with this condition. W. H. Porter (Columbia Med. Jour., vol. xx, No. 4, '98).

It is characteristic of physiological albuminuria that the quantity of albumin is generally small and that the excretion is, in most cases, intermittent, or cyclical. Leube, Pavy, Fürbringer, Klemperer, and many other authors have studied this condition.

Pavy introduced the denomination "cyclical albuminuria" for the cases in which the albuminuria ceases and returns at regular intervals.

Literature of '96-'97-'98.

Case of a chlorotic girl, 15 years old, in whom albuminuria was of the cyclical type: albumin appeared about 11 A.M., and reached a maximum about 3 o'clock in the afternoon, diminishing thereafter until it disappeared completely by 8 o'clock P.M., and remaining absent during the night. Recalling an observation of Heubner's, who found cyclical albuminuria in several members of the same family, the author examined the urine of two sisters and two brothers of the patient and found the same condition in one of the sisters, a girl of 13 years, also chlorotic. Treatment of the chlorosis had no effect upon the albuminuria.

Schön (Jahrbuch f. Kinderh., B. 41, S. 307, '96).

Pavy likewise insists upon posture as the invariable cause of cyclical, or intermittent, albuminuria, the excretion ceasing when the subject is in the recumbent position and going on only when he is walking or standing. The cycles are commonly completed within the day, but in a case narrated by Klemperer there were two cycles, the maximum of albuminuria taking place in the forenoon and afternoon.

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Three cases of intermittent albuminuria which occurred in the same family. As often as six times, based upon as many observations, attention has been called to the family character of this disease. In the family of the children mentioned above, gout is hereditary, a very important fact as regards the etiology of the disease. Lacour (Lyon Méd., No. 25, '97).

Effect of rest in bed: in one case, in a girl 8 years of age, of wasting and loss of appetite, the average daily amount of albumin passed for five days, while the child was running about, was 51 centigrammes. She was then kept in bed for five days, and the average daily amount of albumin sank to 4 centigrammes; in the next five days, during which she was running about again, the average daily amount of albumin rose to 36 centigrammes. The fall on going to bed and the rise on getting up were immediate. The proteids present in the urine in these cases are serum-albumin, serum-globulin, and nucleo-albumin. Keller (Jahrb. f. Kinderh., B. 41, p. 356).

In many instances bicycling gives rise to an albuminuria that cannot be distinguished with the microscope from that of genuine kidney disease, but one that must be looked upon as physiological, since it disappeared within a few days after cessation of the exertion, leaving absolutely no signs of disease. Observations made on twelve bicyclists, eight of whom were trained and four untrained. Among the eight trained wheelmen there was only one whose urine contained albumin before the exercise, but after it the urine was albuminous in seven. In six of them, including the one whose urine was free from albumin, there were at the same time present in the urine casts in numbers as great as are generally met with in acute or chronic parenchymatous nephritis; and the two others had a few hyaline casts. Most of the casts were hyaline; the minority showed distinct renal epithelia and were granular. Free renal epithelia were found in every instance. White blood-corpuscles appeared sparingly, but red corpuscles were not met with at all. Among the four untrained wheelmen, in all of whom the urine was free from albumin before the exercise, two showed albuminuria and one cylindruria after riding from an hour and a half to three hours. Mueller (Münchener med. Woch., No. 48, '96).

Albuminuria, particularly cyclical or irregular albuminuria, may be frequently due to gastro-intestinal autointoxication. Case in which hydatid cysts of the liver caused marked constipation and icterus and distinct albuminuria; latter disappeared after operation upon the cysts and recovery from disturbed condition of digestive organs. The function of the liver and of thyroid gland is particularly important in such albuminuria, since disturbance of either organ may lead to production of toxic substances which cause albuminuria. A. Praetorias (Berliner klin. Woch., Apr. 4, 11, '98).

The diagnosis of physiological albuminuria ought not to be made except in cases when persons presenting no other symptom of disease excrete, constantly or intermittently, a urine containing a scanty quantity of albumin, but no morphotic elements and especially no casts. The centrifugal apparatus, now coming into general use, will certainly contribute to restrain the number of these cases.

Even when no casts can be found, albuminuria ought never be regarded as absolutely inoffensive. Although a

cyclical albuminuria continuing years may be compatible with perfect health, still many authors (Johnson, Greenfield, Bull, etc.) are of the opinion that it signifies the first stage of the evolution of granular atrophy of the kidneys. The albuminuria often found in parturient women (Aufrecht saw it in 56 per cent. of all cases) must also be regarded as physiological.

[The general opinion that has been formed by physicians on the subject of albuminuria and life-insurance seems now to be that they ought to take a much wider view than they have hitherto taken, in regard to the attending circumstances connected with albuminuria, and that they should hold the patient for a long time under close observation before they form a prognosis which shall prevent him or her from being rejected by the insurance board. On the medical side the view is that great numbers of persons who are in sound health remain uninsured, because the reports of the medical examiners refer merely to occasional and physiological albuminuria. If, it is said, it be true that the mere matter of brisk physical training or exercise, like fencing, may produce a temporary albuminuria, what hitherto unknown risks a man wishing to be insured may undergo from error of diagnosis! This, which is the medical side of the question, is undoubtedly exceedingly important testimony; but it will be a long time, even when these admissions are fully indorsed and confirmed, before the public will reap the benefit of the new lines of research that have been opened. There are, in this matter, two sets of officials concerned,—the scientific, or medical, examiners, and the directors who have the responsible duty of selecting lives recommended to them. The first of these officials (the medical) may prove themselves, and may be proved, to be strictly correct. They may learn to diagnose correctly all the varieties of albuminuria which have been sketched out above and they may also learn, in a particular case, how far the prognosis may reasonably be extended; but, for all that, it will be a very long time before they get over the term of "albuminous urine." It is true that many persons are rejected on that term, and, perhaps, improperly rejected; but, on the other hand, it is equally true that the mortality from albuminuria, amongst persons insured, is alarmingly great. The last is a concrete fact which the records of the insurance office are constantly revealing. The director, therefore, has to take into account a favorable special prognosis, in connection with what is unfavorable, when the whole of the record is appraised. He has to weigh a medical opinion, resting, as he would say, on favorable probabilities, against a dead proof that, in the main, albuminous cases go wrong,—a method which will lead him to reject what seems favorable until the scientific demonstration becomes, by repeated experience and observation, absolutely demonstrable. Sir Benjamin Ward Richardson, Assoc. Ed., Annual, '93).

The presence of albumin in the urine, in any form and under any circumstances, may be regarded as indicative of change in the renal or glomerular epithelium. Osler ("Principles and Practice of Medicine," second edition, p. 768, '95).

Literature of '96-'97-'98.

Albuminuria is due to two series of causes: infections and intoxications. If these are intense from the outset, disorganization of the kidney, uræmia, and death may rapidly supervene; if moderate, albuminuria may exist without inducing important disturbances, and, in such cases, once the cause is removed, it will disappear in its turn, unless bad hygienic conditions, too long duration, or heredity do not render the kidney less resistant and thus permit the setting up of a chronic nephritis, the evolution of which will be independent of the original pathogenic cause. Arnozan (Jour. de Méd. de Bordeaux, Sept., '96).

Seven instances among one hundred and twenty-two primary vaccinations in which traces of albumin in the urine were observed. In cases of revaccination albuminuria was somewhat more frequent: ten times in fifty-four cases. Schnaase (Wiener klin. Rund., Feb. 9, '96).

Pathological Albuminuria. — Pathological albuminuria is found in pathological changes of the blood—as anæmia, leukæmia, pseudoleukæmia, scurvy, icterus, and diabetes—even when the kidneys do not present pathological changes.

It is also found in many disorders of the nervous system, as epilepsy, migraine, psychosis apoplexy, neurasthenia, and Basedow's disease, etc. Delirium tremens has also been mentioned as a nervous disease often complicated with albuminuria.

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Delirium tremens is always accompanied by fever and is probably provoked by a microbic toxin or an autointoxication. Jacobson (Hospitalstidende, p. 193, '97).

Two hundred and fifty-three analyses of urine of 16 epileptics, showing that albuminuria was constantly present after the attacks; it persisted from four to eight and even twelve hours, gradually disappearing. When albumin was already present, amount after paroxysm was increased. As a rule, the more severe the paroxysm, the greater the degree of albuminuria. Galante (Riforma Med., Apr. 27, '98).

Although the kidneys, theoretically, are believed to be healthy in the diseases mentioned above, there is no doubt that albuminuria, in many cases of this class, is caused by pathological changes of the kidneys.

In all febrile and especially in all infectious diseases albuminuria is a very frequent symptom. It has been noticed in enteric fever, diphtheria, variola, after vaccination, in erysipelas, influenza, rheumatic fever, etc. In these cases the albuminuria is caused by changes in the composition of the blood, increase of blood-pressure, rise of temperature, and finally by changes in the structure of the kidneys, especially of the tubular epithelial cells.

Albuminuria has been observed in diseases of the intestines, dilatation of the stomach, ileus, ruptures, etc., and in renal venous congestion caused commonly by disease of the heart or the great vessels.

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Albuminuria may be produced by intestinal disorders in children; may be due to the injurious action on the renal epithelium of the toxic products of abnormal fermentations. Jacobi (N. Y. Med. Jour., Jan. 18, '96).

It is present in all diseases of the kidneys. Acute as well as chronic albuminuria is generally found, whether the diffuse form of nephritis or as circumscribed diseases—such as infarctus, abscesses, or tumors—be present. After retention of urine the portion of urine first passed is frequently albuminous.

Certain remedies may also give rise to albuminuria.

Case of fulminating nephritis after hypodermic injection of the salicylate of mercury. Albuminuria at no time seen to appear after injection of corrosive sublimate, though especial search was made for it. Lewin (Deutsche med.-Zeitung, No. 1, '95).

Case of a syphilitic subject who, after antisyphilitic treatment with 4¼ ounces of mercurial ointment and the iodide of potash, developed œdema of the lower extremities, and 8 per cent. albumin in the urine. Another attempt at treatment by inunction caused the albumin to increase to the enormous quantity of 60 per cent.: after discontinuing it he slowly recovered, while the albumin decreased decidedly in amount. Saalfeld (Deutsche med.-Zeitung, No. 1, '95).

Chlorate of potash, which is often used to prevent mercurial stomatitis, is frequently the cause of the appearance of albumin in the urine. Case of a young physician who died after employing

small quantities of this drug in a mouth-wash. Acute poisoning by this drug is easily recognized by the large quantity of albumin and blood in the urine. Mankiewicz (Deutsche med.-Zeitung, No. 1, '95).

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Case in which albuminuria and uræmia were apparently produced by the application of a blister. Huchard (Revue de Thér. Medico-Chir., Apr., '96).

Examination of 8000 specimens of urine derived from 201 syphilitic men, 79 syphilitic females, and 35 persons who were not syphilitic. Albuminuria found in 25 of the men, and in the women marked albuminuria in 4 cases. In 35 cases of bubo, the urine of which was examined 363 times, a trace of albumin was only found on 2 or 3 occasions. The administration of mercury in no case gave rise to very marked albuminuria. Lewin, who has used hypodermic injections 80,000 times with sublimate, has never seen nephritis result. It seems evident that the bichloride is the preferable preparation for hypodermic injections. Julius Heller (Schmidt's Jahrbücher, No. 1, '97).

The prognosis and treatment of albuminuria, therefore, depends entirely on the origin and causes of it, and the reader is referred to the various diseases in which it occurs as a symptom.

Tests.—By means of the tests commonly employed the presence of albumin in the urine is revealed, but no attempt is made to discern between the different proteids; the differential diagnosis between the serum-albumin, globulin, etc., will be given later on.

The sample of urine to be examined must be very limpid without deposits of any kind; if this be not the case, the urine should be filtered previous to the examination, because a slight cloud of coagulated albumin will only be discernible when the fluid is very clear before the reagent has been added. When the urine contains many bacteria, even repeated filtration will be insufficient to make it clear; this can then be done, however, by addition of a solution of sulphate of magnesia and of carbonate of soda. By shaking the mixture a precipitate of carbonate of magnesia is formed, and when this is removed by filtration the filtrate will be perfectly clear. In many cases a few drops of caustic soda will clear the urine, but urine treated in this manner will not give a precipitate of albumin by boiling, while the test of Heller is practicable also in this case.

Test by Boiling.—A few cubic centimetres of urine are heated to the boiling-point and some (5 to 10) drops of nitric acid added. When the urine is acid the albumin will ordinarily coagulate by boiling alone and precipitate as a whitish powder or in small flakes. The nitric acid is nevertheless in all cases to be added, as well in order to complete the precipitation of albumin as to avoid mistakes caused by the presence of a precipitate of phosphates or carbonates, —which will immediately dissolve when nitric acid is added. This test is very delicate and will reveal 0.01 to 0.005 per cent. of albumin. Instead of nitric acid, acetic acid can be employed, but while the nitric acid is to be added after boiling and in a quantity of 5 to 10 drops, acetic acid is added before the boiling, and only a sufficient quantity should be employed as to make the urine but slightly acid. This is especially necessary when the urine is alkaline, because the alkaline albuminates with a surplus of acetic acid give a compound which is not coagulated by boiling.

Heller's Test.—Three to four cubic centimetres of urine are poured in a test-tube and two cubic centimetres of nitric acid are cautiously floated down along

the sides of the tube. The nitric acid collects on the bottom of the test-tube, and where the fluids are in contact a distinctly limited disc of grayish-white precipitate will appear. When only traces of albumin are present the precipitate will only take place after some minutes. The more or less distinct violet coloring which also appears at the point of contact of the two fluids is due to decomposed indican.

This test is very delicate and reliable; 0.003 per cent. of albumin is revealed by it.

Fallacies.—By the addition of nitric acid the urates are also precipitated; these will not form a limited disc, but render the urine turbid. Resinous acids (copaiba) are precipitated by nitric acid, but are dissolved by the addition of concentrated alcohol.

> Urea may also become a source of error by giving a precipitate of nitrate of urea. Long (N. Y. Med. Jour., Apr., '91).

Test by Acetic Acid and Potassic Ferrocyanide.—The urine is rendered acid by acetic acid, and some drops of a solution of potassic ferrocyanide are added. This reagent, the serum-albumin, the globulin, and the albumoses are precipitated, while none of the normal constituents of the urine are (Huppert).

Heynsius's Test.—A still more delicate test than Heller's is that of Heynsius, by acetic acid and sulphate of soda. The urine is rendered acid by acetic acid, and an equal volume of a saturated solution of sulphate of soda (or of common salt) is added. The mixture is boiled, and all kinds of albumin will then be precipitated in white flakes.

The Magnesium-Nitric Test (Roberts's).—One cubic centimetre of nitric acid is mixed with five cubic centimetres of a saturated solution of sulphate of magnesium and a small quantity of this mixture is added to the urine. The albumin will be precipitated as a distinct ring.

Metaphosphoric acid (Hindenlang) also precipitates albumin in the same manner as nitric acid, but this test is not as delicate as that of Heller. The solution of metaphosphoric acid must be freshly prepared for use, as the solution easily changes to orthophosphoric acid, which does not precipitate albumin.

Picric-Acid Test (Johnson).—A few drops of a saturated solution of picric acid will cause a white precipitate when albumin is present; this test is only indicative of the presence of albumin, however, when the precipitate appears immediately. After some time the urates and the creatinine will also be precipitated (Jaffé).

Fallacies.—By addition of picric acid the peptons, the resinous acids,—such as those of copaiba,—and alkaloids—such as morphine—are precipitated.

Perchloride-of-Mercury Test.—A 5-per-cent. solution of perchloride of mercury will precipitate albumin in urine which is rendered acid by addition of a few drops of acetic acid.

Fallacies.—Xanthin is also precipitated by this reagent.

Millen's Test.—A solution of nitrate of mercury is added to the urine and the mixture heated to boiling. Nitrate of potash is then added; the albumin presents as a precipitate of red flakes.

Tanret's Test.—The reagent of Tanret is composed of perchloride of mercury, 135 grammes; iodide of potash, 3.32 grammes; glacial acetic acid, 20 cubic centimetres; distilled water, sufficient to make 100 cubic centimetres. Some drops of this mixture are added to the urine, and will coagulate the albumin. It will also, however, precipitate

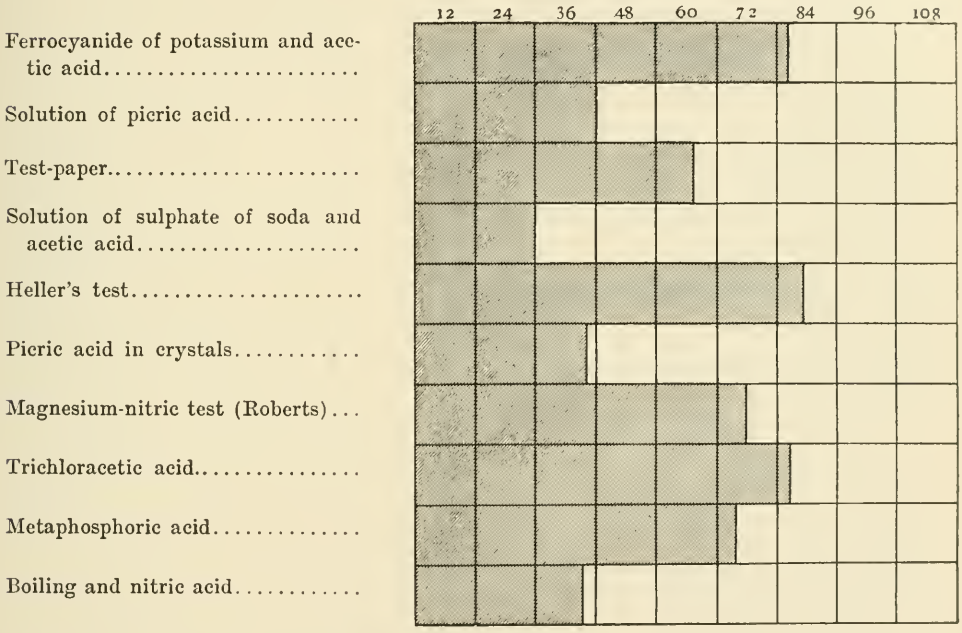
the urates. Many other reagents have been recommended, which cannot be mentioned in detail.

As a very delicate test, the use of salicylsulphuric acid is recommended. George Roch (Pharm. Centralhalle, '89).

A small crystal of trichloracetic acid is added to 1 cubic centimetre of urine previously filtered; when the acid dissolves a sharply-defined zone of turbidity arises on the juncture of the clear urine and that saturated with the acid. Raabe (Merck's Bull., Apr., '91).

urine which is to be tested should be clear and rendered acid by means of a few drops of acetic acid. If there be albumin present, upon immersion of a slip of paper in the urine a distinct precipitate will appear.

Pavy recommends test-pellets containing ferrocyanide of soda and picric acid; when albuminous urine is well shaken with a parcel of the pellet, albumin will be precipitated. The relative delicacy of the tests most frequently em-



Xanthoprotein Test.—Albuminous urine heated with a surplus of concentrated nitric acid will take a yellow color, and some of the albumin coagulates in yellow flakes, which are soluble in alkalies with an orange-red color.

Transportable Reagents for Albumin.—Hoffmann and Aazette employ strips of test-paper previously placed in a solution of the double iodide of potassium and mercury until saturated, then removed and dried. The

ployed is graphically represented by Unger-Vetlesen, in the diagram shown here. The longest columns indicate the most delicate tests.

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In choosing a test for serum-albumin great delicacy should not be considered so essential a quality as reliability. In fact, oversensitiveness has been urged as an objection to more than one of the methods. What is required is a test which is of sufficient delicacy and which

possesses a selective action for serum-albumin, precipitating that body while exerting no action upon other urinary products. A. R. Elliott (N. Y. Med. Jour., Sept. 5, '96).

Sulphosalicylic acid, a white crystalline substance produced by heating salicylic acid with concentrated sulphuric acid, precipitates all proteid substances. It shows traces of albumin in a dilution of 1 to 50,000. This reagent was first discovered by Reoch, then by MacWilliam, who employs sulphosalicylic acid in the form of a saturated solution. Personally employed by adding some of the crystals to a small quantity of filtered urine contained in a test-tube. The tube is then shaken. If albumin is present, a white homogeneous precipitate appears instantly. The urine should be acid. If the urine is alkaline it effervesces after the sulphosalicylic acid is added. If albumin is presented in the smallest traces, a cloudiness appears. When nitric or acetic acid is used for tests, small traces of albumin give rise to stringy, multiform particles suspended in a clear menstruum, the interpretation of which often gives rise to doubt. Sulphosalicylic acid gives a uniform opalescence which is unmistakable. Richard Stein (Med. Record, Jan. 16, '97).

Fifty samples of urine investigated each of which, from character of sediment, was judged to contain albumin. Those urines were selected in which small traces only of albumin were assumed to be present. With Millard's test, reaction was obtained in forty-eight of the fifty specimens. Two samples showed no reaction with any test; so that with Millard's test comparative efficiency would be 100 per cent. Roberts's test showed 86 per cent.; potassium ferrocyanide, 66 per cent.; nitric acid, 60 per cent.; heat, 52 per cent. Dilutions up to 1 in 320 showed positive results with all the reagents. When strength was reduced to 1 in 640, only Millard's test showed reaction, and the limit to the reaction was about 1 in 1280. Unless peptone is present in large quantities, it is not precipitated by action of Millard's reagent. J. W. Garratt (N. Y. Med. Jour., July 16, '98).

Quantitative Tests. — The only method which gives fully reliable results is the gravimetric method. One hundred cubic centimetres of urine are cautiously heated to the boiling-point; if precipitation does not take place a few drops of a weak solution of acetic acid are added; the liquid is now brought on a weighed filter and the precipitate repeatedly washed with hot water. When the water has been removed from the filter by strong alcohol, the filter is dried by a temperature of 120° to 130° C., and the percentage of albumin determined by weighing.

For clinical use several approximate methods have been invented.

Esbach employs an albuminometer,— *i.e.*, a graduated glass tube; this tube is filled to one mark (*U*) with the urine and then to the mark *R* with the test-solution consisting of picric acid, 10 grammes; citric acid, 20 grammes; water, 1 litre. The tube is then closed with a rubber stopper and the contents cautiously mixed. The mixture is allowed to stand undisturbed for twenty-four hours and the quantity of precipitated albumin then read off. The reading indicates in grammes the amount of albumin per litre.

Christensen recommends another method: the albumin contained in five cubic centimetres of urine is precipitated by ten cubic centimetres of a watery solution of tannic acid (1 per cent.). The albumin having been precipitated, one cubic centimetre of an ordinary gum-arabic mucilage is added, the volume brought up to 50 cubic centimetres with water, and the whole converted to an emulsion by agitation. Upon a piece of white paper, ruled with black lines 0.5 millimetres wide and at equal intervals, is placed a cylindrical glass measuring four centimetres in

diameter. This is half-filled with water, and as much of the emulsion run in as possible without obscuring the black and white lines beneath the vessel. From the number of cubic centimetres required, reference to a table of calculations arranged by Christensen furnishes the proportion of albumin present in the emulsion. When the urine is alkaline it should be faintly acidified with acetic acid before the precipitation of albumin. This test can be made as well by daylight as by the light of a good lamp, and requires only ten or fifteen minutes; but is not applicable to urine containing a small amount of albumin, the variations amounting to two-thousandths.

The polariscope is sometimes employed to estimate the quantity of albumin, but this test is not very reliable. It is true that albumin is lævorotatory, but this is also the case with normal urine, and sometimes the color of the urine is too dark to allow the use of the polariscope.

Miscellaneous.—By the tests above mentioned, as well qualitative as quantitative, the different coagulable proteids contained in the urine are precipitated; it is rarely of any use to differentiate them one from another.

Pure globulinuria without the simultaneous presence of serum-albumin does not occur. In order to precipitate the globulin alone the urine is rendered alkaline with solution of ammonia, after some time filtered, and the filtrate mixed with an equal volume of a saturated solution of sulphate of ammonia. If globulin be present a flaky precipitate will appear.

[The same result can be obtained by using a solution of sulphate of magnesia, which does not precipitate the other proteids of urine, or by diluting the urine until it reaches a specific gravity of 1002 and leading a slow current of carbonic acid through it for two or four hours. After twenty-four to twenty-eight hours the globulin will be precipitated. Levison.]

The hemialbumose, or propepton, which seems to be a mixture of different albumoses, may be revealed by saturation of the urine with chloride of soda and addition of acetic acid. When hemialbumose is present a precipitate will appear which dissolves by the addition of much acetic acid and heating, but reappears when the liquid cools again.

Nucleo-albumin, in small quantity, seems always to be contained in the urine. It is revealed by the addition of an excess of acetic acid to the urine, which becomes turbid, indicating the presence of a larger quantity of nucleo-albumin. When the urine is very much concentrated it should be diluted with water before adding the acetic acid, as the nucleo-albumin is held in solution by the salts of the urine.

F. Levison,
Copenhagen.

ALCOHOL.—Alcohol of the pharmacopœias is one of a series of hydrocarbon compounds, all of which have as their base a radicle called ethyl, whose chemical composition is expressed by the formula C_2H_5. Chemically, alcohol is a hydrate of ethyl, or hydrated oxide of ethyl. To distinguish it from other members of the group, particularly fusel-oil (amyl-alcohol) and wood spirit (methyl-alcohol), the alcohol of medicine is called ethyl-alcohol. It is known in the British Pharmacopœia as rectified spirit or rectified spirits of wine, from its being obtained by distillation and subsequent rectification, or purification, from

a mash of potatoes or grain, or from wine. What is known as strong alcohol contains 91 per cent., by weight, of pure spirit (U. S. P.), and has a specific gravity of 0.820. Dilute alcohol contains 45.5 per cent., by weight, of pure spirit (U. S. P.), with a specific gravity of 0.928.

Alcohol is usually exhibited in medicine in different diluted forms, known as beverages, which may be grouped according to the percentage of alcohol present in them. The so-called *spirits* (whisky, brandy, rum, gin, arrack) contain about 50 per cent. of alcohol. The heavy wines (port, sherry, Madeira, etc.) contain about 20 per cent., but are usually too sweet for the use of sick persons; when "dry" (free or nearly free from sugar), they are frequently useful to convalescents and to those who are debilitated. The light table-wines (claret, Burgundy, Champagne, Tokay, Moselle, hock, and Rhine wines) contain from 5 to 10 per cent. of alcohol; many of the Rhine wines are, however, not suited to those having a tendency to the oxalic diathesis, on account of the oxalic acid which they contain. Malt liquors (ale, stout, beer) contain diastase, which aids the digestion of starchy foods and tends to produce obesity. They are especially tonic in their effects and contain from 3 to 15 per cent. of alcohol.

Pure alcohol is also used in combination with various tinctures and aromatics, to secure accuracy of dosage, to avoid the effects of the more irritating ingredients of poor or bogus liquors, and often in private practice to avoid collision with the prejudices of the laity, or again when there is a tendency toward the abuse of alcoholic beverages.

Dose and Physiological Action.—Alcohol, in prolonged contact with the skin, evaporation being prevented, penetrates the tissues beneath the cuticle, owing to its tolerably-high diffusive power, and excites a sense of heat and superficial inflammation. It may be thus employed as a counter-irritant. Owing to its volatility, alcohol is sometimes used topically to cool the surface of the body. It coagulates albumin and is sometimes used to cover sores or wounds with a thin, protective, air-excluding layer, which promotes healing.

Taken internally, the effects vary according to the size of the dose taken. When a small dose is taken, it constringes the mucous membrane of the mouth and throat (often used diluted as an astringent gargle in relaxed throat, scurvy, salivation, etc.), and, on reaching the stomach, it produces a sense of warmth, which is quickly followed by a feeling of general well-being, comfort, and restfulness. The heart-beat is sometimes accelerated; the arteries are relaxed. The muscular fibres of the skin are relaxed, and the blood becomes more equally distributed over the different parts of the body; if the extremities are pale and cold, they may resume their natural color and temperature. The glands are stimulated generally; the perspiration is increased; the amount of urine is augmented, and the secretions of the mucous glands throughout the alimentary tract respond to the increased stimulus. The appetite, when poor, is improved, the special senses rendered more acute, and relaxation and meteorism of the intestines are relieved.

In the stomach a double action is observed on both the gastric juice and the secreting membranes. A small quantity of alcohol produces an insignificant effect on the pepsin of the gastric juice; a larger quantity, however, inhibits or destroys entirely its food-dissolving action. In like manner, a small quantity

of alcohol augments the secretion of the gastric juice; larger quantities cause inflammation of the mucous membrane, with increased secretion of a thick, tenacious mucus and a loss of secreting power. The appetite becomes impaired or lost and a feeling of nausea is induced.

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Elaborate investigations on the influence of alcoholic drinks upon the chemical processes of digestion: Whisky can be regarded as impeding the solvent action of the gastric juice only when it is taken immoderately and in intoxicating quantities. Chittenden and Mendel (Mod. Med. and Bac. Rev.; Brit. Med. Jour., Oct. 31, '96).

Alcoholic fluids, in moderate quantities, do not delay digestion, and may stimulate in many cases. C. A. Ewald (Zeit. f. Krankenpflege, Jan., '98).

The secretion of saliva is affected by dilute alcohol and alcoholic drinks much as it is by other gentle irritants in the mouth. Upon gastric secretion all alcoholic fluids have a marked effect in increasing the amount, the acidity, and the total solids, the digestive power being also increased. Gastric digestion in dogs is not much influenced by alcohol. Alcohol is rapidly absorbed from the stomach, a moderate quantity always disappearing under half an hour, and probably very little of it ever passes into the intestine. Chittenden, Mendel, and Jackson (Amer. Jour. Physiol., Mar., '98).

Conclusions as to the influence of alcohol upon tissue-growth and cell-growth summed up as follows: 1. Alcohol acts primarily on the nerve-cells, changing their granular matter, breaking up their nutrition, and changing their dynamic force. 2. This action is followed by contraction and atrophy of the dendrites; shrinking of cell-walls, as in fatigue; and coalescence and disappearance of the granular protoplasm. 3. The special injury from alcohol seems to be on protoplasm and terminal fibres of nerve-trunks; the irritation and inflammation of the nerve-walls and fibres ending in sclerosis are common. 4. Alcohol acts on the leucocytes, checking their activity, and destroying their function. These are driven in masses by the increasing rapidity of the heart, and become blocked in the capillaries, forming centres of obstruction and injury. 5. The use of alcohol is followed by diminution of the carbon dioxide and all waste-elimination, with a marked sensorial palsy and a slowing of all mental operations. T. D. Crothers (Jour. Amer. Med. Assoc., Nov. 26, '98).

Alcohol has, in general, a very slight germicidal action. At normal temperatures it may kill non-spore-bearing bacteria, but not the spore-bearers. Its action is strongest in 50- to 70-per-cent. strength and weakest when in strongest concentration (absolute alcohol). When boiled, or heated under pressure, it acts according to its percentage of contained water. Alcoholic solutions of disinfectants have less effect than the corresponding aqueous solutions, and their germicidal power varies inversely as the strength of the alcohol in which they are dissolved. Rafael Minervini (Zeitsch. f. Hyg. u. Infects., Oct. 25, '98).

Alcoholic Poisoning.—The toxic effects of alcohol are those of an irritant poison, and may be acute or chronic. The *acute form* of alcoholic poisoning occurs when an excess has been taken at once or within a short interval of time. In the milder form the ingested alcohol produces intense irritation of the stomach, with increased secretion of a mucus altered in character, nausea, and vomiting. The kidneys are the seat of irritation, the result of which is an increased secretion of urine. If the irritation be too intense, the glomeruli may become so swollen as to diminish or even prevent the secretion of urine, in which latter case acute temporary suppression of urine results. The blood becomes charged with the abnormal products (through the abnormal condition of the stomach and its secretions), and these are excreted by the renal organs in the

form of uric and oxalic acids, oxalate of lime, and urates; and, from overstimulation of the nervous system and excessive glandular activity, the triple phosphates, with altered pigment-matter; so that, following an alcoholic excess, a large quantity of pale urine is followed later by a highly-colored, strong-smelling secretion. When enormous quantities are ingested, more serious symptoms, sometimes even followed by death, result. The symptoms point to intense gastro-intestinal irritation, with irritation of the cerebro-spinal system so great as to produce convulsions, coma, or death.

In the frog non-fatal doses of the drug in the normal animal become fatal after the liver has been extirpated. The symptoms appear more rapidly and are more intense, all the symptoms of poisoning being caused by doses the effects of which can hardly be perceived in the normal frog. Ablation of the brain also intensifies the phenomena of alcoholic intoxication, but these effects are, nevertheless, inferior to those observed after removal of the liver. C. Giofredi (Giornale del Assoc. Napol. di Med., etc., p. 83, '93).

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Definite quantities of the different alcohols administered to rabbits by means of œsophageal tube. Three degrees of intoxication were distinguished according to their severity: (1) slight paralysis of motion and sensibility; (2) total paralysis of motion with almost complete abolition of sensation; (3) coma, often ending in death. The toxicity rose with the boiling-point of the alcohol, methyl being least toxic and ethyl coming next, while propyl was twice, butyl three times, and amyl four times as toxic as ethyl. Addition to ethyl-alcohol of 4 per cent. of an alcohol of higher boiling-point increased the toxicity of the former to a marked extent. The addition of 2 per cent. was much less powerful, while 1 per cent. had practically no effect in increasing the toxicity. Conclusion is that the symptoms of acute alcoholism are not due to impurities in the ethyl-alcohol; but it is left an open question whether these may not have some share in producing the more chronic results of alcoholic excess. Baer (Arch. f. Anat. u. Physiol., Oct., '98).

Conclusions regarding effects of alcohol on blood are as follow: 1. In acute alcoholic intoxication the carbonic acid as well as the alkalinity is greatly reduced, due to the fact that there is an increase of volatile fatty acids, which, for the moment, displace the carbonic acid. The decrease of the red corpuscles cannot be of importance, as it is not constant. 2. The effects of chronic alcoholism make themselves fully manifest only after several months. The alkalinity remains about normal; the oxygen decreases, and later also the carbonic acid. Thomas (Arch. f. exper. Path. u. Pharm., B. 41, H. 1, Mar., '98).

Treatment of Alcoholic Poisoning.—The treatment of acute alcoholic poisoning (drunkenness) is best begun by washing out the stomach either by emetics or by the stomach-pump or by ingestion of large quantities of warm water. Complete rest, induced, if necessary, by large doses of one of the bromides, and relief of nausea and depression by large doses of ammonia (spirit of Mindererus, or aromatic spirit), are of prime importance. The cold pack is also of great use. The use of coffee in large doses (in both acute and chronic cases) refreshes and stimulates the nervous system, and with rest and warmth assures a rapid recovery.

If convulsions and coma are present rectal injections of chloral may be used, followed by the cold pack. Atropine, digitalis, and morphine may also be of service, though the prognosis is usually fatal. (See ALCOHOLISM.)

Therapeutics.—There is considerable divergence of opinion as regards the use of alcohol in disease. The older view is that it is a valuable agent when judiciously employed, and that stimulants are especially indicated in cases of fa-

tigue, in convalescence from acute diseases, in persons who live a sedentary life, or who suffer from poor digestion, and in others who are prostrated from acute illness. In all these cases a glass of wine or a little brandy diluted with water, taken shortly before or with the food, is thought to stimulate the digestive organs and enable the patient to take more food. Pure alcohol is sometimes given alone or in combination with some bitter tincture, as tincture of calumba or quassia, or compound tincture of gentian or cinchona.

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Observations in man on the influence of alcohol on muscular work, by means of Mosso's ergograph: an arrangement something like an extension apparatus, with a weight and pulley on which muscular traction can be made, the amount of work done being registered in kilogrammeters graphically. Summary of the results:—

1. Moderate quantities of alcohol have an appreciable influence on the working capacity of muscles; but this differs in the fatigued and fresh muscle.

2. In the unfatigued muscle alcohol lessens the extent of its maximum contraction, owing to decrease of peripheral irritability of the nervous system.

3. In the fatigued muscle alcohol increases the working capacity, as its extensibility is increased.

4. A fatigued muscle, however, under the influence of alcohol, never attains to the working power of an unfatigued muscle, because the lessening of the peripheral nervous irritability by the alcohol interferes with the development of its full working power.

5. The action of alcohol on muscle is developed in a very few minutes after it has been swallowed, and lasts a considerable time.

6. In all cases the alcohol diminishes the feeling of fatigue, and the work appears easier.

7. After moderate amounts of alcohol the increase is not followed by any decrease in the muscular power of fatigued muscles; after large amounts of alcohol the symptoms of muscular paresis are prominent, and increase with the dose.

Alcohol, therefore, has a twofold action on muscular work: first, on the nervous system it diminishes centrally the feeling of fatigue, and peripherally the excitability; while, secondly, it furnishes food-material which can be oxidized to produce energy and work. Hermann Fey (Edinburgh Med. Jour., Sept., '97).

Influence of various circumstances on muscular activity of animals investigated. The experimental fact that a rich diet decreases voluntary activity, is proved to hold true for rats also. To alcohol, however, the latter kind of animal was found unexpectedly refractory. No decrease in activity was produced by 20-per-cent. solutions. Only when the alcohol was given in the form of a 20-per-cent. to 60-per-cent. solution was a marked diminution observed. C. C. Stewart (Amer. Jour. Phys., vol. 1, p. 40, '98).

According to Harnack, who has closely studied the question, alcohol in small or medium doses exercises simultaneously a stimulating action upon certain functions and a depressing action upon others. This fact should never be lost sight of; otherwise the physician exposes himself to the danger of injuring instead of benefiting his patient. It should also never be forgotten that, even in small doses, the paralyzing action of alcohol is exercised most rapidly and most energetically upon the tonus of the blood-vessels,—the importance of which tonus for the regularity of the circulation and the preservation of cardiac energy is well-known. For this reason alcohol should be given with caution in cases in which the heart is already enfeebled, as in acute diseases of long duration, or in convalescence from such affections. It sometimes happens that the patients themselves refuse alcoholics; in which case they should never be com-

pelled to take them, but should be given digitalis instead, which, even in small doses (5 minims in 6 ounces of water), acts solely upon the heart, but in this way establishes the tone of the blood-vessels. The acceleration of pulse, often observed after the administration of digitalis, is doubtless due to the improved nutrition of the cardiac muscle.

Alcohol, far from being a stimulant in small quantities, is a narcotic and sedative in all doses, and both in health and disease it weakens the vital powers. H. Arnott (Canadian Practitioner, Oct. 1, '91).

Surgeons of former days used alcohol very extensively to combat shock; but the old theories of shock have been proven erroneous, and alcohol has consequently become unnecessary. It will be less and less used in the future, and the discredit into which it has fallen is justified. Victor Horsley (Med. Pioneer, July, '94).

The use of alcohol as a stimulant or tonic in the treatment of disease is delusive and more or less injurious. By diminishing the internal distribution of oxygen and the activity of the leucocytes it directly diminishes man's vital resistance to the action of all morbific causes, while by its anæsthetic effect on the cerebral convolutions, it lulls him into a false feeling of security. N. S. Davis (Med. Pioneer, Oct., '94).

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Alcohol removes, in great measure, the controlling influence of the smaller arteries on the heart, and causes, also, paresis of the vagus. The result is increase in the number of cardiac beats, dilatation of surface-vessels, a feeling of surface-warmth, with reduction of the temperature of the body. It can scarcely be considered a food, as in itself it contains no one of the constituents of which the body is made. It gives no warmth to the body. This is proved by the thermometer. The disuse of it by deer-stalkers, Canadian hunters, and Arctic explorers is additional proof of this. It gives no strength. It distinctly weakens the muscles. Professor Parkes realized this by experiment in the last Ashantee War. Acting on the same views, the Great Western Railway, during the alteration of rails along the whole line, substituted oatmeal gruel for alcohol, because the work had to be done with rapidity and with unusual energy. The relief of Chitral tells the same story, and so do our great national games. It does not lengthen life. Long Fox (Bristol Medico-Chir. Jour., Mar., '96).

Trial, at the instance of the State attorney, of Dr. Hirschfeld, accused of having caused, or accelerated, the death of a man suffering from serious inflammation of the cellular tissues of the left arm, ushered in by pyrexia (blood poisoning) by withholding alcohol. Dr. Hirschfeld pleaded that he believed alcohol to be mischievous, experts' opinions showing the great change of medical opinion as to the therapeutic value of alcohol, and upheld the principle that it is inadmissible to put any limit to the exercise of the individual judgment of the physician. Verdict of acquittal. Editorial (Brit. Med. Jour., Aug. 15, '96).

Fevers.—While alcohol is very useful in many cases of fever, there can be no reasonable doubt that all cases of fever do not require it, while many cases are best treated without it. The special indications for its exhibition are: general debility; rapid, small, or irregular pulse; the condition known as the typhoid state and recognized by the presence of hebetude, indifference, jactitation, muscular twitching, subsultus tendinum, muttering delirium; coma vigil or even a more active delirium, with signs of great weakness; a dry or brown tongue, sordes, and, perhaps, involuntary evacuation of urine or fæces. If the patient is being benefited by the use of stimulants, the following effects will be observed: The tongue becomes moist; the pulse becomes slower; the skin becomes comfortably moist; the breathing becomes more and more tran-

quil; sleep is produced; delirium is quieted or disappears.

> Temperance Hospital's results for a series of years show that, out of 66 cases of typhoid fever treated without alcohol up to 1886, 61 had recovered. Rev. D. Burns (Brit. Med. Jour., Mar. 24, '88).
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> [While in the London Temperance Hospital the results are good in the surgical department, recovery is apt to be too long delayed in medical cases treated without alcohol, and patients often die from exhaustion after a very lingering sickness. J. P. C. GRIFFITH, Assoc. Ed., Annual, '89.]
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> While not opposed to the use of alcohol in suitable conditions, collective view is that it should not be given indiscriminately in diseases. Von Jaksch, Erb, Merkel, Nothnagel, Jürgensen, Rühle, Finkler (Boston Med. and Surg. Jour., May 3, '88).
>
> Alcohol should only be used as a stimulant in the acute infectious diseases of children, and even then it should be given in small doses. If possible, alcohol should never enter the body through the stomach, but should be applied to the skin, or given in some gruel by an enema into the bowel. A. Seibert (Archives of Pediatrics, Dec., '90).

POISONED WOUNDS.—Alcohol is a valuable remedy in the toxæmia produced by poisoned wounds, snake-bites, etc., if used immediately and freely. In these conditions the dose is to be regulated by the effect, as very large doses are not only tolerated, but required, to be of any use.

ACONITE POISONING.—Stimulants, freely administered (best by hypodermic injection for rapid action), are useful in this grave condition, in which the whole plan of treatment is directed toward stimulation and the prevention of syncope. (See ACONITE.)

EXTERNALLY.—Alcohol used externally is detergent, antiseptic, disinfectant, astringent, and hæmostatic. These properties make it a valuable agent in the treatment of wounds, especially if the seat of infection. Whisky, plain or diluted (1 to 4), may be used. For non-infected wounds and granulating ulcers the vinum aromaticum (U. S. P.) is a valuable dressing.

In snake-bites and insect-stings, strong alcohol combined with ammonia is a useful lotion after the poison has been sucked out of the wound.

Alcohol (8 p.) combined with ammonium chloride (1 p.), vinegar or dilute acetic acid (4 p.), and water (64 p.) makes a valuable evaporating lotion, which may be perfumed if desired. This is useful in headache; strained and swollen joints, muscles, and tendons; abscesses, erythema, erysipelas, and slight burns. For bathing fever patients, alcohol is useful, alone, or combined with vinegar when there is diffuse diaphoresis.

Alcohol is used as a detergent, alone, or combined with sodium bicarbonate (2 p.), alcohol (8 p.), water (80 p.), or in the form of soap liniment. Applied to irritated, fissured, or excoriated nipples, dilute alcohol hardens the surface, and coats the raw surfaces with a delicate protective film (by coagulating the albumin in the secretion of the raw surface) and diminishes the sensibility of the terminal nerve-filaments.

Ulcers or aphthæ are benefited by the local application of strong alcohol.

INHALATIONS.—Inhalations of alcohol have proved useful in the treatment of shock, collapse, and the profound asthenia met with in fevers and toxic conditions, especially when alcohol cannot be taken by the mouth or given by the rectum. A 10-per-cent. solution of alcohol may be administered by steam or hand-spray apparatus, or by pouring alcohol or spirits into a vessel of hot water,

throwing a towel over the vessel and the patient's head.

Injections.—*Tumors.*—The use of alcohol in carcinoma has been productive of encouraging results. Interstitial injections of very strong alcohol have been used by Vulliet, of Geneva, as a palliative in inoperative cases of cancers of the uterus. The beneficial action obtained this author ascribed to the local ischæmia induced.

Carcinoma of the uterus was also treated in 1878 by Hasse with alcohol, injections being made into the circumference of the growths in three cases with good results. After twenty-three years the patients were alive and well. There had been formation of connective tissue around the neoplasm, obliteration of the blood-vessels, and shrinking of the tumor.

To prevent the recurrence of growths a mixture of 30 parts of absolute alcohol to 70 parts of water should be injected twice a week around the tumor. O. Hasse (La Semaine Méd., Oct. 16, '95).

Alcohol as a curative measure, injecting it into various tumors. Ten to 20 minims are injected in one side of tumor, then as much in another place; continued till every part is touched with alcohol. J. W. Young (Charlotte Med. Jour., July, '95).

More recently this treatment has been employed in cancer of the breast with encouraging results.

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Case of cancer of the naso-pharynx in which the injection of unfiltered erysipelas-prodigiosus toxins had failed. In view of the inevitable fatal outcome, injection of alcohol after the method of Schwalbe and Hasse tried. The injections were begun on October 14, 1896, beginning with 3 minims of absolute alcohol and rapidly increasing to 30 minims. The reduction in size began after the seventh injection, and after the eleventh but few remnants of the growth remained. After a dozen or more injections the needle would not penetrate into tissues capable of retaining the alcohol, and after a few additional attempts, at intervals of a week or longer, they were discontinued. In February, 1897, the naso-pharynx was found both by inspection and palpation to be entirely free from growth or any suggestion thereof. Examination of secretions of tumor confirmed the diagnosis of cancer. Edwin J. Kuh (Medical Record, Apr. 17, '97).

Case of cancer of the breast treated by injections of alcohol. On February 20th, with a mixture of 40 parts absolute alcohol and 60 parts distilled water, 23 syringefuls, each of 20 minims, were injected deeply into the tissues all around the tumor, and into the axilla in the neighborhood of the enlarged glands. The injections, averaging from 22 to 25 syringefuls each time, were repeated about every fifth day until May 2d. Each sitting occupied about three-fourths of an hour; the injected fluid had a great tendency to run back again, to obviate which a smear of collodion over the needle-pricks is the best preventive. The patient experienced considerable immediate pain from the injections, lasting from one-half to one hour. After the second series of injections the patient declared that the sensations in the breast were altered, the shooting pains were no more felt, and the itching on the surface of the breast, which she had complained of, disappeared and never recurred. After the subsidence of the immediate painful effects of all the other injections, the patient felt more comfortable in every way. When the process had been continued for five weeks, the parts around the tumor began to be œdematous, but still the injections were continued into and beyond the œdematous parts. During the sixth week the patient and her nurse stated that they considered that the growth was less, and certainly at the beginning of the eighth week (April 11th) the whole breast, including the tumor, had diminished in size.

After this date, all the parts, breast and tumor, rapidly shrunk, until in May there was actually nothing left of the mamma to be felt by the hand, and

practically nothing left of the tumor but the nipple and slight thickening under it. There was still œdema in the injected area. The glands in the axilla could not be detected. At this time Mr. Windsor examined the case (May 12th) and stated "that whilst the right was a fairly large hanging breast, the other—the left breast—had practically disappeared, the nipple only remaining; that he did not find any thickening under the pectoralis nor enlarged glands in the axilla." After these seventeen injections, a complete structural change to all appearance having taken place, it was intended to continue the injections at longer intervals for a considerable time, but unfortunately the patient became ill otherwise. She lost her appetite, became slightly jaundiced, and on examining her in bed on May 16th it was found she was suffering from cancer of the liver with ascites. This being the case nothing further was done; the patient rapidly got worse, and died on June 10th. The mamma was found to be replaced by a dense, fibrous-looking mass with several processes extending into the surrounding fat and firmly connected with the subjacent pectoral muscles. The skin was rough, superficially ulcerated at one place, and adherent to the subjacent tissue around the nipple. The nipple was depressed, but not considerably retracted. William Yeats (Brit. Med. Jour., Sept. 25, '97).

In cases of shock, collapse, typhoid state, and profound asthenia, where stimulants cannot be swallowed, whisky or other spirits may be injected hypodermically, with the advantage of rapid absorption and speedy action. Antiseptic precautions should always be observed.

When an anæsthetic is to be given, it is a very good plan to give from one-half to one ounce of brandy or whisky an hour before. The patient takes the anæsthetic better, and there is less danger from heart-failure. But during chloroform or ether narcosis alcohol should not be given, for it will only add to the existing trouble. A. B. Walker (Columbus Med. Jour., May, '92).

[We are glad to observe that the truth concerning the noxious action of alcohol in narcosis from anæsthetics, determined by Wood in his able, experimental researches, has begun to be disseminated, as it certainly deserves. We believe that the use of hypodermic injections of alcohol in chloroform or ether narcosis, as recommended and employed heretofore, has been an error, and should be abandoned. GRIFFITH and CERNA, Assoc. Eds., Annual, '93.]

Alcohol is a useful food in the small quantity which increases, but does not impair, digestion; which quickens the circulation and the secreting function of the glands, but does not overstimulate; and which can be oxidized in the body. This amount, says Bartholow and others, is from 1 ounce to 1½ ounces of absolute alcohol for a healthy adult in twenty-four hours. All excess is injurious.

In small doses alcohol stimulates the stomach, and consequently promotes hyperchlorhydria and hyperacidity of that organ. In large doses it loses its stimulating action, and the chlorhydric action upon albuminoids is either weak or wanting. M. P. Haan (Progrès Méd., Dec. 21, '95).

The prolonged indulgence in alcoholic drinks in time produces a chronic catarrhal inflammation of the gastric mucous membranes, accompanied by a proliferation of the connective tissues. This latter, by subsequent contraction, obstructs and finally obliterates the secreting follicles and the cells which line them. In this way the mucous membrane becomes thickened, indurated, and uneven, and covered with a coating of thick, tenacious mucus that excites fermentation, with gas and various acids (butyric, acetic, etc.): whence acidity and heart-burn.

These harmful effects on the stomach are much less marked in fever patients

and in those who are convalescing from exhausting diseases.

As the diffusive power of alcohol is great, it passes readily into the blood; little finds its way very far into the intestines. The effects of alcohol on the other organs of the body (liver, kidneys, brain, and vessels), as it passes through them on its way in the circulation, will be considered under POISONING.

Even in large quantities, alcohol appears neither to promote nor to hinder the conversion of starch into sugar.

Parkes and Wollowicz hold that alcohol does not diminish the oxidation of the body. G. Harley found that alcohol, added in small quantities to blood withdrawn from the body, lessened its absorption of oxygen and its elimination of carbonic acid.

As to the effect of alcohol on the body-temperature, it would seem that a small quantity, in a subject not accustomed to its use, causes increased activity in all the bodily functions and a slight elevation of temperature. Considerable doses of alcohol cause a decline in temperature of the body, which is even more marked when fever is present, except in patients in whom a decline of temperature does not follow in doses short of lethal. This reduction of temperature produced by alcohol is, doubtless, referable to the diminished rate of tissue metamorphosis, for it has been ascertained that the excretion of both urea and and carbonic acid is lessened by alcohol; the combustion of the nitrogenous and carbonaceous foods is retarded. This action results in an increase of body-weight, as seen in the rotundity of those who take spirits moderately.

> Greely experienced in Arctic latitudes that, when spirits were given while the men were on the march, the power of resistance to cold was impaired; but that when taken in small quantities, 2 ounces, after the day's work was over, there was a distinct stimulation of the mental faculties. (Amer. Med. Digest, Feb. 15, '88.)
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> Alcohol does not affect the total quantity of heat produced; more heat is dissipated than produced; the fall of temperature is due to the excess of dissipation and is in direct proportion to that dissipation; and, in all likelihood, alcohol, by undergoing oxidation, yields energy in the form of heat, thus conserving the tissues and acting as a food. Reichert (Ther. Gaz., Feb., '90).
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> Alcohol is mainly burnt up in the system when taken in moderate quantities, but when ingested in excessive amounts is partly eliminated by the breath, the kidneys, and the intestines. Alcohol is a conservator of tissue, a generator of vital force, and may, therefore, be considered as a food. David Cerna (Ther. Gaz., April 16, May 15, June 15, '94).

The action of alcohol on the heart is most important. When the heart is weakened by debilitating diseases (pulse always quick and weak), it strengthens the contractions and, by its tonic influence on the heart, alcohol strengthens the pulse and reduces its frequency. It stands first as a safe and efficient cardiac stimulant.

> Cases in which it is contra-indicated: endocarditis, pericarditis, meningitis, epilepsy, eclampsia, chorea, acute diseases of the skin and certain chronic forms (as eczema, psoriasis, etc.), nodular rheumatism, and the gouty diathesis. Jules Simon (Med. Age, July 25, '90).
>
> Alcohol, in one or other of its various forms, is often recommended as an aid to a weak heart and to a feeble digestion, but it is so only temporarily, and always tends to enfeeble a weak heart and to lessen the power of a feeble digestion, when continued for any length of time, and ought to be given up. When old habits are too strong, only light claret or light and white hock should be taken with dinner. Whisky is preferable if there is the slightest tendency to gout. Balfour (Edinburgh Med. Jour., June, '91).

> Alcohol ought to be given very sparingly, indeed, to people with chronic cardiac disease, and one great consideration is that, having once begun to give it in such cases, it is very difficult, if not impossible, to leave it off. It is obnoxious in that it tends to diminish the desire for food, and perhaps may actually aggravate the tendency to induration, arterial and valvular, which already exists. Alcohol should certainly be sparingly given. Sidney Coupland (Clinical Jour., Mar. 21, '94).

The condition of the system causes great variation in the physiological effects of alcohol. In convalescence from acute diseases, in the condition of shock from serious injury, loss of blood, or snake-bites, quantities which would, under normal conditions, cause intoxication, are taken with impunity.

The extremes of life (infants and the aged) bear alcohol well. Habitual use modifies more decidedly the influence of alcohol on temperature, circulation, and the nervous system.

In the diseases of childhood all forms of gastro-intestinal disturbance can be excluded from the list of diseases in which alcohol is beneficial. In acute cases, even in cholera infantum, large quantities of water with a small amount of black coffee or tea will stimulate better than alcohol, while it is not irritating to the already-diseased mucous membrane. It is especially irrational and harmful to administer alcohol in the diarrhœas of children before the stomach and bowels have been freed from all putrefying material.

In the typhoid fever of childhood Seibert rarely gives alcohol. The disease usually runs a mild course and relapses seldom occur if proper diet is adhered to. In pneumonia the enormous quantities of alcohol which are frequently given are irrational; they should only be used when collapse threatens or is present, and then in large doses and in concentrated form. Alcohol-fed children digest less perfectly in pneumonia than others, and do not regain their appetite and digestive power after the attack is over as those do who are treated without it.

> While champagne usually agrees well with adults, it scarcely ever agrees with children. In infectious diseases, with the exception of diphtheria, the author rarely uses alcoholic stimulants, and even in diphtheria the use of alcohol is not begun on the onset of the disease, but is only used when the circulatory or nervous system demands it. Joseph E. Winters (Archives of Pediatrics, Dec., '90).
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> It is seldom necessary to give alcohol to children under five years of age. Diphtheria is the only disease in which there is much difference of opinion in the matter. Delafield (Practice, Feb., '91).

C. Sumner Witherstine,

Philadelphia.

ALCOHOLIC NEURITIS.

Definition.—Inflammation of the peripheral nerves, especially those of the extremities, due to the excessive use of alcohol.

Symptoms.—The first symptom of alcoholic neuritis consists usually in neuralgic and tingling pain, especially in the lower limbs, less commonly in the upper limbs. Long prior to these first painful sensations there generally are feelings of debility, lethargy, anorexia, or uneasiness, with disturbed sleep. The sufferer labors under *malaise*, cannot tell what is the matter, and rarely seeks medical advice till the pains become severe.

Alcoholic paralysis of the upper limb usually affects the muscles animated by the musculo-spiral nerve, and is often complete, which is the opposite of what is usually seen in plumbism.

Wrist-drop and foot-drop occur from the extensors being more affected than the flexors. The facial muscles and the sphincters may be affected in very rare cases. These pains are usually followed by difficulty in walking, which in turn is due to paresis of the leg-muscles and ataxia.

A distinctive walk, called the high-stepping, or pseudotabetic, gait, consists in raising the foot and throwing it forward, the toes hanging down causing the patient to raise the heel, the sole being visible from behind. This "high stepping" is seen only when foot-drop is distinct. It resembles the gait of a man meeting obstacles while walking.

When the lower limb is affected, and when the patient is lying down, the foot forms an obtuse angle with the leg, its outer edge is lower than the inner, and the phalanges are flexed. The patient cannot move his toes or raise the outer edge of the foot. The foot can be extended on the leg, but only slightly flexed on it. Usually the paralysis begins by the extensor proprius hallucis, followed by the extensor communis and the peronei; the quadriceps may be also affected, and may indeed be the only muscle paralyzed. (J. Babinski.)

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Two cases of paralysis of the left vocal cord due to alcoholic neuritis. In the first case there had been, for fifteen days, such a feebleness of voice that the patient, a clergyman, was unable to fulfill his duties. There was no thoracic affection and no sign of locomotor ataxy. The left vocal cord was in the cadaveric position. The patient gave a history of recent sciatica in the left leg, but accompanied also by a pronounced anæsthesia of that member. The patient, although never drunk, was accustomed to drink a quart of strong, English beer at luncheon and dinner, and in the evening a considerable quantity of brandy. Complete abstinence was enjoined and carried out, and fairly large doses of nux vomica prescribed. By the end of four weeks the voice had completely returned and the vocal cord had regained its normal functions. Dundas Grant (Archives de Laryng., May, June, '97).

Later on, atrophy of the muscles may be noted, supplemented sometimes by degeneration reaction to electricity. The knee-jerk is lost early in the history of the case. The hands and feet may become swollen and congested when allowed to hang down.

Anæsthesia of the legs, and even of other portions of the body, is frequent. Indeed, disturbances of the sensibility may be noted when motor disturbances are of little importance; the opposite, however, does not occur. On the other hand, paræsthesia may be present, pressure on the muscles and nerves causing great pain. Cutaneous reflexes are sometimes diminished in extent and rapidity.

Convulsions and fever rarely occur. Mental symptoms are occasionally present, but they are frequently slight, amounting only to irritability, unrest, and suspicions.

In a proportion of cases there are delirium and extravagant hallucinations resembling those of general paralysis, the most characteristic being a loss of appreciation of time and place. (Wilks.)

Recent events are forgotten, while ancient ones are remembered. The ocular disturbances of alcoholism are bilateral, symmetrical, and affect both eyes equally. They chiefly consist in a central scotoma, ellipsoid in shape, with the longer axis horizontal; red and green are the first colors not seen. Ophthalmoscopically, the temporal side of the disc is discolored. Paralysis of the motor externus, ptosis, and external ophthalmoplegia has been noted. The pupils

may react more slowly than normally to light. (J. Babinski.)

Diagnosis.—Rheumatic pains in the early stages. The failure of sodium salicylate to alleviate the pain, with the temporary lull from opiates, though the pains thereafter persist, soon excludes rheumatism.

General Paresis.—It can be differentiated from this disease by the absence of paralysis of the tongue and lips and of grandiose delusions, by the presence of muscular wasting with wrist- and foot-drop, by the tearing or stabbing pains, by the lost knee-jerk, extreme pain on pressure, and by a feeling of coldness on being touched.

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Alcoholic paralysis is the disease most frequently mistaken for general paralysis. An important differential point is the mode of development of each disease, general paralysis always commencing insidiously, alcoholic paralysis frequently with great suddenness, and it is believed that this sudden development, associated with the perversion of the affections, is almost sufficient to confirm the diagnosis. These features have also been insisted upon by Charpentier. E. M. de Montyel (Revue de Méd., Feb. 10, '98).

Locomotor Ataxy.—In this affection there are girdle pains; urinary and ocular disturbances are almost constant, while atrophic paralysis belongs more especially to alcoholic neuritis. In non-alcoholic locomotor ataxy the toes are raised, but in alcoholic neuritis they hang down. The non-alcoholic comes down on his heel, the alcoholic neuritic on his toes. The paralysis of the former is not so symmetrical and his gait is more uneven and jerky than the latter.

Lead Paralysis.—It may be differentiated from this disorder by the absence of the blue gum-line, and by the much greater prospect of recovery.

Disseminated Sclerosis.—This disease can be eliminated by the absence of head rhythmical tremors, spastic paralysis, and hyperalgesia, which occur in alcoholic paralysis with nystagmus.

From special atrophic paralysis by the absence of pain in the non-alcoholic. From Landry's acute ascending paralysis by the legs being affected first, the arms next, and then the trunk (if at all), and the foot-drop, there being no foot-drop in Landry's, and in the latter the trunk being effected immediately after the legs; besides, Landry's has no muscular atrophy and no alcoholic electrical reaction of degeneration.

From progressive muscular atrophy by the presence of pain and the alcoholic degeneration reaction; so also from chronic anterior poliomyelitis.

From toxic hysterical paralysis by the suddenness of the hysterical onset and cessation.

From cerebral hemiplegia in that hemianæsthesia is rarely met with in that disease. From various nervous affections of a mixed character.

Etiology.—Alcoholic neuritis is more common in women, and in those who have drunk quietly for a long time. It is especially due to the inordinate use of spirits and alcoholized wines, such as sherry, Madeira, etc.

In the neurotic drunkard, paralysis is not so quick in its appearance as in ordinary drunkenness. T. L. Wright (Medical Review, June 17, '93).

One hundred and twenty cases of alcoholic nervous affections, of which only nineteen could be classed as polyneuritis. The motor form was the more frequent, and the ataxic second. Freyhan (Deutsches Arch. f. klin. Med., vol. li, p. 6, '94).

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Child, 3 1/2 years old, who, after a large drink of whisky, went into stupor vary-

ing in depth and lasting more than two months; had a large number of convulsions, partly general and partly limited to the left side; developed right-sided paralysis, which was especially marked in the arm; extreme contractures, especially of the left side, and loss of faradic irritability with wasting, and during the first two months had pupillary symptoms, strabismus, and repeated vomiting. During six weeks there were the signs of complete consolidation of the right lower lobe. Recovery. Herter (N. Y. Med. Jour., Nov. 7, '96).

Pathology.—Until recently (1881), when Clarke discovered a softening of certain portions of the spinal tissue, the post-mortem appearances seen had been peripheral. Eichhorst found a few diseased patches in the middorsal region besides disease of smaller vessels throughout, and increase of the connective tissue in the lateral column. Schäfer, Payne, and Sharkey found ganglionic inflammatory changes and degeneration. Pal noted degeneration of Lissauer's posterior root-zone in the lumbar region and general involvement of Goll's columns; in another case degeneration of Goll's columns in cervical region, less marked in the dorsal, appearing again in the lumbar. Thomson found disease of the nuclei of some of the cranial nerves in the pons and medulla oblongata. Hun and Kojewnikoff observed slight degenerative changes in the ganglion-cells of the cortex cerebri. Déjerine and Sharkey have described disease in the vagi and phrenic nerves. Congestion of pia mater has been noted. Campbell also noted these ("Trans. Path. Soc. Liverpool Med. Inst.," vol. xxiii, No. 2, '93). The principal changes have been met with in the periphery, generally limited to the finer nerve-terminations, the morbid intensity diminishing with the distance from the periphery. These degenerative changes are generally symmetrical in the upper and lower limbs, the latter being most frequently involved. This peripheral inflammatory degeneration is parenchymatous, the inflammatory process being secondary to strangulation of the nerves higher up. Sometimes the part affected is swollen; at other times the microscope alone reveals the lesion, disclosing a dull appearance from fatty myeline degeneration. The degenerated cloudy portion gradually separates till the segments surround the axis-cylinder as fatty particles. In the sheath and intestinal tissues there is a great increase of the nuclei of the sheaths and infiltration with leucocytes, with thickening of the perineurium. Finlay found wasting of the fibres of the wrist extensors, leucocytes and nuclei crowding the interstitial spaces. In peripheral neuritis are found peripheral lesions; in alcoholic insanity and dementia the lesions are central,—brain shinkage and softening, shallowing of interconvolutional furrows, tortuous atheromatous vessels, and ventricular effusion.

In the optic nerves the interstitial tissue is first affected; there are found many healthy fibres, which is the opposite of what occurs in the optic neuritis of locomotor ataxy, and which explains the clinical aspect of alcoholic amblyopia.

Most important effects of alcohol on the tubular neurin are shrinking and hardening, transmission of impulses being impaired; on vesicular neurin the dissolution of phosphorus, protagon, and lecithin, with selective affinity for the neurin of the cerebellum. Wilkins (N. Y. Med. Jour., Sept. 22, '94).

[Statement as to hardening of the neurin and other tissues by alcoholic ingestion requires further corroboration. Frequently microscopical appearances are deceptive. Norman Kerr, Assoc. Ed., Annual, '96.]

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Experiments (thirty-two) on rabbits and a dog, with alcohol and essential oils for a period lasting from eleven days to one year. The primary lesions were located, not in the nerve, but in the ganglion-cells of the retina (fatty degeneration of the protoplasm, with integrity of the nuclei), the connective stroma of the retina being unaffected. Consequently the observations of writers on lesions of the optic nerve in alcoholic amblyopia probably refer to ascending neuritis consequent on lesions of the ganglion-cells. The interstitial neuritis is consequently not primary, but is secondary to degenerative neuritis. This conception of the pathological anatomy of alcoholic amblyopia explains return of vision in this affection, an event which would be incomprehensible if the sclerotic lesions were primary. Rymowitch (St. Petersburg Thesis, '96).

Prognosis.—Complete recovery may be obtained in the great majority of cases if alcohol be completely renounced. In very grave cases, especially when the patient is not seen in time, total paralysis, and even death may supervene. The amyatrophy of alcoholic neuritis may become extremely marked, and end in the formation of fibrotendinous retractions.

Treatment.—Alcohol must be given up at once and always. Electrotherapy; cold, tepid, hot, or Turkish baths; sponging, and strychnine preparations are recommended. So also are arsenic, nux vomica, cinchona, and the iodides. The food must be easily assimilable.

Alcoholic paraplegia in a woman 30 years old, who was completely cured by combined galvanization of the spinal cord and the paralyzed muscles. Later faradization was employed. Massy (Jour. de Méd. de Bordeaux, Apr. 23, '93).

NORMAN KERR,

London.

ALCOHOLISM.

Definition.—The various pathological changes and attendant symptoms caused by the ingestion of alcoholic beverages.

Varieties.—Two forms are recognized: the *acute,* in which alcoholic poisoning speedily manifests active excitement and disturbance, or in which a sudden exacerbation of the disorders attending the chronic type gives rise to correspondingly-marked symptomatic activity; the *chronic,* in which the continued ingestion of alcoholic beverages in more or less appreciable quantities sets up pathological changes, the morbid transformations gradually involving the various organs and tissues and giving rise to chronic disorders of each of the parts thus attacked.

The older denomination of "delirium tremens" is now considered under the heading of "acute" alcoholism, as are, also, acute alcoholic poisoning, intoxication, acute alcoholic insanity, acute alcoholic paralysis (alcoholic neuritis and alcoholic toxic hysterical paralysis), acute alcoholic epilepsy, etc. To make this article more intelligible, it was deemed best, however, to adopt the following subdivisions: ACUTE ALCOHOLIC INTOXICATION, drunkenness; ACUTE ALCOHOLIC DELIRIUM, delirium tremens: ACUTE ALCOHOLIC MANIA, mania a potu; and CHRONIC ALCOHOLISM, the meaning of which has already been given.

Acute Alcoholic Intoxication.

Symptoms.—Three stages are discernible in this condition. The first is vascular relaxation, when the intoxicated is usually lively, merry, agile, and joyous; all excitement and energy; in the highest spirits, cheerful, hopeful, and communicative; mercurial and confiding, often telling his private affairs to

strangers. There is a warm glow of color on his countenance, he looks at his best. Gradually his spirits rise still higher; he becomes more demonstrative in love or in argument, more emphatic in his gestures, more furious in his fun, and very much louder in his laughter, as the second stage is ushered in. With this he is becoming much less reasonable and amenable, incoherence of thought and speech gradually set in, the imagination revels, exaggeration is a prominent feature, and his emotions dominate him, intellect, reason, will, and conscience rapidly fading in the background. In some cases his thoughts, speech, and actions are exaggerated. In other cases these are transformed, the usually modest, retiring man becoming a boaster and a braggart, the truthful a liar, the meek violent. With all this, speech thickens, the lower and then the upper limbs cease to act in unison, the intoxicated cannot stand, but staggers with paralytic drunken unsteadiness of gait, the muscles becoming flabby and feeble. The third stage of "dead drunkenness" reveals an unconsciousness with the pallor of apparent death on the face, extreme coldness, accompanied by total insensibility and an utter disregard of the "world without" and the "world within." Sensation, perception, volition, and emotion, all are absent. Through this living death, in the heart and circulation lingers the only spark of vitality which keeps the unconscious drunkard just alive till the faculties, if they do emerge, have emerged from the depth of narcotism into which they were plunged. In some cases the first pleasurable stage and the second, less pleasant, may vary in intensity and duration, but the last insensible stage usually lasts from six to twelve hours. These successive groups of symptoms, or stages, may be described as "the three acts of the drama of intoxication."

Alcoholic acute poisoning is sometimes manifested as epileptic explosions. These are, in some cases, with a known epileptic neurosis, the indirect effect of alcoholic provocation; but there are other cases in which acute alcoholic excitation seems to directly, after a certain quantity of poison has been taken, set up epileptic seizures (these seizures appearing only after the ingestion of alcohol), in which cases no epileptic attacks or tendencies are ever observed so long as alcohol is not drunk. Purely hysterical paroxysms are also excited in some cases by the consumption of even small doses. Some of the subjects so apt to be toxically affected in this way never display hysterical symptoms at other times.

Hysterical manifestations are produced by alcohol in two groups of cases: (1) those of young women, naturally well balanced and unaccustomed to the use of alcohol, who take an amount which (for them, at least) is excessive; (2) cases of older women, of a neurotic type, who are accustomed to use spirits more or less freely. Certain phenomena of true hysteria are usually absent in those who are under the influence of alcohol, such as the visceral manifestations, areas of anæsthesia, paralyses, and contractures. The diagnosis is often very difficult, especially at the time of the menstrual period, when so many women use spirits for the relief of dysmenorrhœa. Alcohol should not be prescribed, particularly to young girls, during the menstrual period or in slight ailments. Cases of hysteria after inebriety are clearly traceable to this dangerous practice. A small amount of alcohol would upset a woman not an habitual tippler. Henry C. Coe (Amer. Medico-Surg. Bull., Feb. 1, '94).

Alcoholism epilepsy is due to a predisposition to epilepsy, which manifests itself through the influence of alcohol.

Curable by abstinence. Forel (Le Bull. Méd., Aug. 25, '95).

Etiology.—Though the toxic action of alcohol in the causation of alcoholic intoxication is the same in kind, all kinds of alcohols being poisonous, the toxic action is modified, in a minor degree (1) by the variety of the alcohol; (2) by the idiosyncrasy of the drinker. The heavier and less highly rectified spirits (anlylic and butylic) are more toxic than the lighter (ethylic and methylic). Spirits are more acutely toxic than equal quantities of wines and beers, from the greater concentration and quantity of the alcohol in the former, tending more intensely to acute congestion and irritation of the gastric mucous membrane, the liver, kidney, heart, and brain. Absinthe induces epileptic convulsions; and methylism is much more rapid in its course than ethylic alcohol. The temperament and constitution of the drinker also occasion some difference of symptoms, one subject getting drunk at once "in the legs," another "in the tongue."

In dogs wine-alcohol produces depression and inebriety lasting four to five hours; beet-root alcohol, comatose sleep and anæsthesia lasting twenty-four hours, followed by illness; maize-alcohol, the same plus subsultus tendinum. Magnan (Le Bull. Méd., July 31, '95).

Cause of alcoholism depends more upon the quality than upon the quantity absorbed. Alglave (Quarterly Jour. of Inebriety, Oct., '94).

Of all alcoholic drinks the most dangerous are the liquors containing essential oils, such as the various absinthes and anisettes. The least harmful are those made without essential oils—from chemically-pure industrial alcohol, brandy, bitters, etc.—by means of non-toxic flavoring materials. For an identical proportion of alcohol, wines are more toxic than wine-brandies, which, in turn, are more toxic than brandies artificially prepared by means of well-rectified commercial alcohol. Generally white wines are less toxic than red wines. Wines treated with plaster and diseased wines are exceedingly toxic. Experiments made by means of intravenous injections in rabbits demonstrating the above. Daremberg (Archives de Méd. Expér., vol. vii, p. 6, '95).

Furfurol is one of the most dangerous poisons of alcohol. Natural wine and alcohol produce exhilaration; toxic alcohols produce criminal impulses, stupefaction, and death. Laborde (N. Y. Med. Jour., Aug. 17, '95).

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Methylic alcohol is a poison which gives rise to thermal, respiratory, circulatory, motor, and sensory disturbances. Its co-efficient as to experimental toxic power is very high and varies for the dog and rabbit from 16 to 20. Its co-efficient as to true toxic power is much weaker; at about 10 for the rabbit, it amounts to 9 for the dog. Its noxious effects in chronic intoxication are very rapid and well-marked. It is the more dangerous from the fact that it is but slowly eliminated. It is more toxic for the dog than for the rabbit, and somewhat more toxic in intramuscular than in intravenous injections. A. Joffroy and Serveaux (Arch. de Méd. Exp., vol. viii, No. 4, p. 473, '96).

Pathology. Post-mortem Appearances.—In a fatal case seen by me, of a married woman, aged 41, who had died without recovering consciousness in 5¼ hours after swallowing at a draught 2¾ pints of whisky, the face was pale, the eyes suffused and dull with dilated pupils, the temperature 91° F.; the pulse was thin, compressible, and barely perceptible; the breathing stertorous, the skin cold and clammy. There are sometimes also congestion of the liver, cerebral congestion with ventricular serous effusion, and distension of right heart-cavities with semi-fluid blood. In another case, that of a man who was found dead after a drinking-bout, the mucous membrane of the

stomach was so inflamed and angry, with patches of a deeper hue extending over the pyloric surface to the duodenum, and a grumous, slightly muco-purulent exudation from bleeding-points, that arsenical poisoning was suspected. Tardieu in one case found pulmonary apoplectic extravasations of blood.

The first pathological stage of intoxication is one of vascular relaxation, with vasomotor paralysis and reduced inhibition; the second, one of continued inhibitory reduction, with incomplete partial paralysis of the brain- and nerve-centres, with intellectual automatism, accompanied by loss of co-ordination. The third stage is one of advanced paralysis, for the moment complete, with automatic existence and the reduction of temperature by 3 to 7 or more degrees.

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Poisoning with alcohol in considerable doses, continued over a moderate time, will produce decided and ascertainable lesions of the nutrient structures and nervous elements of the cerebrum, very similar in character to the pathological lesions produced by other more virulent soluble poisons. Henry J. Berkley (Johns Hopkins Hosp. Reports, vol. vi, '97).

Differential Diagnosis.—In the first two stages, the exhilarative and the preliminary automatic, simple nerve excitement, opiate or other narcotic excitation, and apoplexy may simulate the symptoms of alcoholic intoxication; but the non-alcoholic rapidly subside, the apoplectic either passing off or going on quickly to coma. Usually the history or the surroundings reveal the presence of alcohol.

In the last, or third, stage of alcoholic insensibility the difficulties are much greater. The breath may smell of liquor, but that alone is not a safe guide; I have known abstainers taken to a police-cell, owing to some by-stander having poured brandy down the throat of the unconscious nephalist. Apart from a history of drinking, only withdrawal of alcohol from the stomach can prove an alcoholic origin. It has been asserted that pressure on the supra-orbital notches, thereby compressing the nerve, will elicit signs of life in the alcoholized.

Coma.—The comatose state of diabetes and albuminuria (in uræmia there may be albuminuric retinitis with normal or enlarged pupils) may be differentiated by a urinary analysis, though it must be remembered that both of these conditions may exist with alcoholism, and also with the odor of acetone from the breath. The renewal of the alcoholic symptoms by inhalation of the vapor of ammonia has been suggested by Waters.

Opium or Belladonna Poisoning.—From opium poisoning, pin-point pupils, and from belladonna poisoning, the equal dilation of the pupils usually exclude alcoholism, but alcohol may be present with either of the other poisons. Sometimes the greatly lowered temperature points to alcoholism.

Apoplexy.—The respiration is usually stertorous and the coma deeper. Hemiplegia may be evident from the greater flaccidity of the limbs on one side. The urine may contain albumin; auscultation may reveal some cardiac lesion; the breath will not smell of alcohol, *unless* the attack has occurred in a person who has been drinking, or some one, since the attack, has administered some alcoholic stimulant. Conjugate deviation of the eyes may exist.

Epilepsy.—In this disease there is a history of clonic convulsions. The pulse is rapid, dicrotic (Trousseau), and rather fast; frequently the urine and fæces

have escaped, while the tongue may have been bitten.

The frequent mistakes in diagnosis committed by medical experts have demonstrated the practically insuperable difficulty in forming an accurate judgment till time be given for the disappearance of alcoholic symptoms. "For a time it may be impossible to determine whether the condition is due to uræmia, profound alcoholism, or hæmorrhage into the pons Varolii."

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Diagnosis between acute alcoholism and traumatism: external injury suggests the possibility of grave internal lesion. However, no mark of violence may be found upon the closest inspection; a fracture of the skull or a hæmorrhage within the cranium may have no outward sign. Or a heavy wagon may pass over the body, fracturing the ribs, rupturing the liver, perforating the intestines, or injuring other vital organs without producing any external mark. (See ABDOMEN, CONTUSIONS.) Primary shock, following immediately upon the injury, will exhibit a subnormal temperature and a small and fluttering pulse, nausea, vomiting, cold and clammy skin, and relaxed sphincters.

Depressed fractures at the vertex may be detected by palpation. Fissured fractures may be found upon inspection, with the help of an incision if necessary, or the finger-nail or a probe may be passed across the surface. When the blood is wiped from a suspected part and no fresh blood appears, there is a suture; if fresh blood oozes to the surface, there is a fissured fracture. In fracture of the base there will usually be found hæmorrhage from the nose, mouth, and ears, and ecchymosis into the conjunctiva or subcutaneous cellular tissue; or vomited blood may have been swallowed after fracture of the ethmoid or sphenoid, followed by hæmorrhage into the posterior nares. But absence of such hæmorrhage does not necessarily indicate absence of fracture.

A rare, but positive, symptom of fracture of the base is the escape of a watery fluid, probably cerebro-spinal fluid, from the ears, the nose, or the mouth. Fractures of the petrous portion of the temporal bone involving the tympanum may produce in the temporal or mastoid region a pneumatocele: a smooth, circumscribed, resonant, non-fluctuating tumor.

Cerebral irritation usually follows a blow upon the forehead or the temple. The patient lies on one side, is restless, with the extremities flexed and the eyelids firmly closed. If the eyelids are forcibly opened, the pupils are found contracted and intolerant of light. The surface is pale and cool, or even cold. The pulse is small, feeble, and slow. The patient is irritable, muttering, and grinds his teeth when disturbed. The sphincters are not usually affected and there is no stertor.

There will be a rise in temperature in head injuries, except in primary shock and in large uncomplicated hæmorrhage, when the temperature is likely to be subnormal (Phelps). Other signs of intracranial lesion are photophobia, with the eyelids firmly closed, intolerance of sound, the carotids beating forcibly, a blowing of the lips, a flapping of the cheeks, rigid contraction of limbs, and clonic or tetanic convulsions. The Cheyne-Stokes respiration is found in injury to the brain and cerebral hæmorrhage. The breathing becomes, by degress, deeper and more rapid up to a certain point, and then subsides in the same gradual manner until there is a complete cessation of respiration, with a deep silence, the pause before the next respiration lasting a variable time.

Unilateral phenomena point to intracranial lesions; for instance, unequal pupils or ptosis of one eyelid or drooping of one corner of the mouth. There may also be found in the radial pulse a want of symmetry in fullness and strength upon the two sides of the body.

In a suspected case the patient should be kept under observation until the effects of a debauch have worn off; symptoms of head injury, which may have been masked by the acute alcohol-

ism, may then become manifest. John B. Huber (Med. Record, Feb. 20, '97).

Treatment.—External heat should be applied, especially to the abdomen and feet; the room should be heated; the stomach should be emptied and washed out with warm or tepid water. No alcohol is to be given, but warm milk; if emesis occur, milk with soda or lime-water, barley-water, or rice-water; if there is collapse cinnamon (or ammonia in small doses) may be added to the milk, or cardamoms, cinnamon, and ginger in warm water. Chloroform, given with care, has been recommended against convulsions.

In slight cases, an emetic and warmth. Ipecac or an hypodermic injection of $^1/_{10}$ grain of apomorphine may be used to produce emesis.

Ammonium carbonate has been used with great success in doses of 1 drachm dissolved in water. It acts as an emetic and antidepressant.

Acute alcoholic intoxication is treated at St. Mary's Hospital, Philadelphia, as follows: A drachm dose of fluid extract of ipecac, with a teaspoonful of whisky, is given as soon as the patient enters the hospital. After free emesis the patient frequently sleeps without further medication. Moore (Univ. Med. Mag., Jan., '90).

For quieting the delirium, 10-drop doses of Squibb's fluid extract of ipecacuanha every 15 minutes until emesis is produced. Schenck (Kansas City Med. Index, Jan., '88).

The patient should be deprived of alcohol, confined in bed, and then given blue pill, followed by a saline cathartic. Insomnia should be met by the wet-pack. Strychnine nitrate, $^1/_{32}$ to $^1/_{60}$ grain, should then be administered and nutrition supported by water, milk, kumyss, broths, soups, meat-juice, raw eggs, arrowroot, fruits, etc. When required, bromide and chloral or duboisine is ordered. Peterson (Jour. Amer. Med. Assoc., Apr. 15, '93).

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The following combinations are recommended:— .

℞ Aromatic spt. of ammonia, 2 drachms.
Tinct. of camphor, 1½ drachms.
Tinct. of hyoscyamus, 2½ drachms.
Spt. lavandulæ co., enough to make 2 ounces.
M. Sig.: One teaspoonful every hour.

When the acute symptoms have been relieved the following may be substituted:—

℞ Pulv. capsicum, 2 grains.
Quinine sulphate, 36 grains.
M. ft. cap. No. xii. Sig.: One capsule before each meal and continue for several days.

Should insomnia be an element, administer the following:—

℞ Bromide of soda, ½ ounce.
Chloral-hydrate, 2½ drachms.
Syrup of orange-peel, ½ ounce.
Water, enough to make 4 ounces.
M. Sig.: A teaspoonful at bed-time and repeated during the night if necessary. Editorial (Med. News, Oct. 16, '97).

Acute Alcoholic Delirium (Delirium Tremens).—This disorder chiefly occurs in habitual drinkers; but it is also observed in ordinary temperate persons after a prolonged drinking-spell. Though mostly met with in spirit-drinkers, it is seen occasionally in beer-, wine-, and cider- drinkers.

Symptoms.—There are two forms,—the traumatic and the idiopathic. They differ little except in the prodromata. In the traumatic form, after an accident (sometimes a slight traumatism) the characteristic tremors, etc., appear frequently without warning; but, in the idiopathic form, the patient who is about to have an attack is restless, uneasy, irritable, sleeps badly if at all, suffers from digestive troubles, and has little desire for food. Delirium then appears. The patient cannot rest, but must be in constant motion. He is shaking all over

("the shakes"), is consumed with terrors, continually in deadly fright of things which he mentally sees, or of persons whom he thinks are after him for the commission of some crime. At other times his dread is of something terrible, though he cannot tell what it is. He is all the while trying to escape from these well-defined or undefined horrors, and, in attempting to escape, fatalities sometimes occur. Hallucinations of sight are most common: snakes, rats, mice, loathsome things, flames, and, in a case of the writer's, roaring lions bounding down the chimney, below the chairs, and rushing in at the windows. The delirium is best described as one of busy wakefulness and suspicion. There is a third non-febrile innocent form, in which the temperature does not rise above 100° F.

Psychomotor hallucinations are rare. Vallon (Annales Médico-psychologiques, Jan., Feb., '95).

Compression of the eyeball causes perception of Purkinje's figures in healthy individuals, visions of objects and persons in four-fifths of patients suffering from alcoholic delirium. Liepmann (Berliner klin. Woch., Apr. 8, '95).

Confirmatory experiments; vision of animals noted in 50 per cent. of cases of alcoholic delirium. Jolly (Berliner klin. Woch., Apr. 8, '95).

Visions of animals are present in 40 per cent. of cases at most. Such patients cannot estimate distances. Liepmann (Berliner klin. Woch., Apr. 8, '95).

The visual imagery of acute alcoholic delirium is also characteristic of chronic alcoholic alienation. They are not primary, but secondary or illusional hallucinations. The uniformity of the animal visual imagery arises from the influence of physical conditions on nervous tissue made abnormally susceptible by alcohol. Normally there is objective projection of appropriate images in motion, and it needs but a retinal condition sufficient to intensify the retinal images of these entoptic objects, and a cortical state of higher impressionability permitting them to dominate consciousness, to induce a kind of ideation in which the idea of objective motion is paramount. This condition is brought about by alcohol. Chaddock (Alienist and Neurologist, Jan., '92).

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Visions cannot be attributed solely to suppression of the influence of the light. Conclusion then reached that in those cases in which external excitations do not provoke the visions these are due to internal mechanical excitations upon the retina. The increase of the intra-ocular pressure due to the contraction of the extrinsic and intrinsic muscles of the eye, produced when the eye is fixed upon anything, may be so considered.

The inner imaginations of delirious alcoholic patients do not refer with a strange predilection to certain animals or to scenes of anguish or fright. Their character rather is divided by the nature of the peripheral excitation than by an anterior tendency given to the mind. If manifestations of anguish and the appearance of certain animals predominate in spontaneous visions, the cause should be sought for outside of the patient.

The author looks upon his method as to the study of sensorial illusions in alcoholic patients as superior to simple observation or questioning. H. Liepmann (Archiv f. Psych., vol. xxvii, p. 172, '96).

Hallucinations of hearing are not so common, but exist in probably 10 to 20 per cent. of cases. Delusions (false perceptions concerning self) are found in from 5 to 9 per cent., mostly delusions of persecution. Sometimes there is one hallucination, illusion, or delusion throughout, sometimes there is a succession.

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Case of an army-engineer, a chronic inebriate, in whom delirium of grandeur and self-satisfaction, with intense ambitions to attain political prominence, came on in a few hours, after a long period of drinking. Subsidence when

spirits were withdrawn and recurrence on the resumption of spirits. Editorial (Quarterly Jour. of Inebriety, July, '97).

The tongue is white and furred. Tremor of this organ, and especially of the muscles, is a more or less marked, but generally present, symptom.

Case of delirium tremens, presumably from absinthe, in a man of 59, with general tremors and reflex hyperexcitability, but with neither nystagmus nor trembling tongue. Collet (Lyon Méd., July 22, '94).

The fever is not very high, being about 100° to 103° F. If higher it is an unfavorable omen. The pulse is soft, rapid, and readily compressed. The skin is clammy. Insomnia is constantly present; but usually sleep and improvement occur on the third or fourth day. In unfavorable cases the patient grows gradually worse and dies of heart-failure.

Diagnosis.—Acute alcoholism may be mistaken for the delirium of meningitis, of typhus and typhoid fevers, and of chronic alcoholism. The history and progress of the case determine the first two, and the absence or significance of thirst, tongue trembling, and tremors the third.

Pulmonary disorders; congestion, especially when of traumatic origin; and pneumonia may also give rise to delirium simulating that of delirium tremens. Fractured ribs may thus become the primary factor of violent accesses. The same may be said of erysipelas.

Pathology.—Acute alcoholism is due to gradually produced changes in the nerve-tissues, and especially to retained products of metabolism. The cerebral lesions in alcoholic delirium are of two varieties. The first is observed in all alcoholics, and is due to the alcohol itself: atheromatous degeneration of the vessels, the degree of disorder increasing as the calibre of the vessel is reduced. The nerve-cells also show granular pigmentation and fatty degeneration.

The second variety is derived specially from the character of the delirium, and not from the alcohol itself. It consists in congestion, hæmatic pigmentation in the capillaries and nerve-elements, and degeneration of the nerves and fibres of the cortex, the precursors of general paralysis.

Peddie's view, propounded a quarter of a century ago, that acute alcoholism is really poisoning from the accumulated effects of alcohol on a nervous and irritable temperament, has much in its favor.

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Delirium tremens occurs when a brain, deteriorated by chronic alcoholism, is influenced by a toxic agent, either due to the action of bacteria or to autointoxication from diseases of the digestive tract, the kidneys, or the liver. The therapeutic treatment is quite incapable of abbreviating the duration of the disease; the critical sleep cannot be induced by any drug. Jacobson (Hospitalstidende, p. 143, '97).

Etiology.—Acute alcoholism may be due to a temporary exacerbation during continuous alcoholic intoxication,—the idiopathic form; or to an accident, sudden shock, or an acute inflammation, especially pneumonia,—the traumatic form.

Psychopaths are extremely susceptible to the narcotic action of alcohol in disease, as well as in health; very small doses cause alcoholic poisoning in such persons. Severe delirium tremens witnessed after comparatively small quantities (1 ½ to 2 quarts) of cider. Forel (Med. Pioneer, Nov., Dec., '93).

Case of delirium tremens in a child 5 years old. Cohn (Berliner klin. Woch., Dec. 24, '88).

The frequency of the supervention of delirium tremens days after an accident

or an attack of illness is a result of the extra call on the nervous system. D. W. Cheever (Boston Med. and Surg. Jour., Mar. 16, '93).

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Study of 247 recovered personal cases of delirium tremens. Of these cases 202 were uncomplicated and 45 complicated by other diseases. Although the delirium tremens cannot be regarded as caused by the action of the pneumococcus, it resembles, in all features, an infectious disease: it has a stage of incubation,—a duration of about four days; it ends with a critical sleep; is accompanied by rise of temperature and almost in all cases by albuminuria; and when autopsy is made the spleen is generally found to be the seat of parenchymatous degeneration, as well as the heart, the kidneys, and the liver. Jacobson (Hospitalstidende, p. 143, '97).

Prognosis.—In private practice the prognosis is favorable in ordinary cases; in hospital practice it is much less so. Of 1241 cases admitted to the Philadelphia Hospital during a fixed period, 121 died. Recurrence occurs if drinking is continued.

[I have noted recurrence from one to five times in 104 out of 442 cases treated in a special institution. NORMAN KERR.]

Treatment.—The patient must be kept in bed and carefully watched. Strapping in bed should not be practiced, as the restraint causes muscular movements and delirium. A sheet tied across the bed in preferable, as this allows more freedom of motion. Attendants or a padded room is best of all. No alcohol should be given, the strength being sustained by foods, milk, soups, etc.

Experience based on 2012 cases of alcoholism warrants the statement that alcohol in any form or quantity is injurious, and that its absolute and immediate withdrawal is important. Latimer (Boston Med. and Surg. Jour., June 16, '92).

Alcohol should at once be withdrawn from cases of delirium tremens, except in old persons long habituated to its use. J. H. Pryor, Van Peyma (Buffalo Med. and Surg. Jour., Jan., '90).

Potassium bromide, ½ drachm, with tincture of capsicum, given every three hours, is recommended for mild cases by Osler.

Hypnal advantageous in commencing delirium tremens. It takes effect in twenty to thirty minutes, the dose for an adult ranging from 15 to 45 grains. It is best given in a 10-per-cent. solution in water, and its slight taste can be covered by a syrup of orange-peel or by an aromatic tincture. Herz (Therap. Monat., Mar., '93).

Sleep should be procured, and the strength supported. As an hypnotic, chloral may be given if the heart be not weak.

Chloral-hydrate is strongly recommended, 20 grains being administered every three hours at first. J. K. Spender (Bristol Medico-Chir. Jour., Mar., '89); Twitchell (Med. News, July 29, '93); Aufrecht (Wien. med. Blät., Oct. 8, '90).

In the young, with elastic arteries and sound kidneys, opium can be given freely. In older patients, where the vessels are not in such good condition, chloral is less dangerous than opium. A. Guépin (Gaz. Méd. de Paris, Feb. 10, '94).

In alcoholic delirium the real chance of recovery lies in sleep. The patient is therefore isolated in a quiet, dark, and, if necessary, padded room, no physical restraint being employed. To procure sleep the patient is given 1 to 1½ drachms of chloral hydrate, with ½ grain of hydrochlorate of morphine, in an infusion of limes. If sleep does not come on in about ten minutes, from ¼ to ⅓ grain of morphine is injected hypodermically. After the alcoholic disturbance has subsided strychnine or nux vomica is given, followed by hydrotherapeutic measures. If there should be gastric complication, an antacid, such

as sodium bicarbonate, is administered. Lancereaux (Bull. Gén. de Thér., Feb. 15, '93).

The heroic doses of these narcotics, with the cardiac depression apt to follow their exhibition, call for deliberation in their administration to aged and infirm inebriates, and I prefer, as an hypnotic, a simple febrifuge frequently repeated, such as repeated doses of liquor ammoniæ acetatis. Sleep, thus quietly and safely induced, has proved much more curative than the sleep for which the author formerly resorted to narcotics.

Chloralamid successfully employed as an hypnotic, in doses of from 15 to 40 grains. Malchine (Meditzinskoje obozrenije, No. 5, '90).

Methylal recommended as an hypnotic. Twenty-one cases reported, about one-half being mild. The drug is used hypodermically in aqueous solution of 1 to 10, each injection containing 1½ grains. Effects not noticed until about two hours later. If sleep does not occur in two or three hours, the dose to be repeated. Methylal is the best sedative so far employed. It does not depress the heart or produce any unpleasant after-effects. R. von Krafft-Ebing (Therap. Monat., Feb., '88).

Paraldehyde recommended as the best hypnotic during the withdrawal of alcohol. Girdon (Quarterly Jour. of Inebriety, Apr., '90).

Paraldehyde contra-indicated in insomnia dependent on acute alcoholism. W. H. Flint (Ther. Gaz., Jan. 15, '90).

Twenty-five cases of alcoholic delirium in which trional was used with advantage. Conclusions: 1. Delirium was controlled with greater rapidity and safety by trional than by other hypnotics. 2. In the majority of cases a marked stimulant effect was observed, possibly on account of the methylic and ethylic elements which enter into the composition of the drug. 3. On account of the low temperature noted in all cases, trional must possess antipyretic properties, thereby simulating its allies of the phenol group. 4. It was always well borne by the stomach, and in one case was rapidly absorbed when administered per rectum. 5. No unpleasant after-effects observed. Bellamy (N. Y. Med. Jour., July 21, '94).

Trional of great value in insomnia. Morphine or opium retards the action of trional. C. H. Springer (Med. and Surg. Reporter, Sept. 22, '94).

A very hot bath gradually cooled and trional, 20 grains, in water containing 10 minims of tincture of capsicum recommended. If in thirty minutes there is no abatement, 10 more grains or trional are given. Forced feeding, — milk, eggs, soups, etc. Bellamy (N. Y. Med. Jour., vol. lx, p. 72, '94).

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In all cases of acute mania, or delirium tremens, the use of hyoscyamine, or the alkaloid hyoscyine hydrobromate, in large doses is recommended. I. A. Marshall (Med. Brief, Jan., '98).

Opium, if given, should be administered cautiously, in the form of morphine, hypodermically. If, after three or four ¼-grain doses, the patient is still restless, no more is to be given.

If fever is present, cold douche, bath, or preferably the wet pack may be tried. If the pulse becomes too rapid and weak cinnamon, with very small doses of digitalis in aromatic spirits of ammonia, should be given. Digitalis in large doses is dangerous. (Osler, Delpeuch, Kerr.)

The patient should be carefully fed milk and concentrated broths being especially useful. If necessary, nutrient enemata are to be administered.

If the delirium occurs during an acute malady or following an injury, two indications must be attended to:—

1. Sustain the patient's strength by frequent assimilable nourishment.

2. Obtain sleep. For this purpose opium may be given at the outset in one full dose, or laudanum may be given by the rectum.

Chloral may be given in doses of 2½ to 3 drachms unless some cardiac or pulmonary complication or depression renders its use dangerous.

If the delirium appears without apparent cause, during chronic alcoholism or following recent excesses, the administration of alcohol as a remedy may become necessary. If the fever be not too high, the delirium too violent, and if the strength of the patient be preserved, it may be withheld; but, if the patient be adynamic, recourse must be had to alcohol, as well as to other diffusible stimulants,—caffeine, subcutaneous injections of ether, or draughts of ammonium acetate. Any form of narcotic should be avoided in these cases. (Delpeuch.)

> Several cases of delirium and cerebral excitement (sometimes followed by loss of consciousness) witnessed in inebriates, after a full dose of caffeine. The administration of this remedy is therefore contra-indicated. In any event it should always be prescribed with caution, beginning with small doses, with instructions to discontinue the medicine on the appearance of the slightest agitation. Czarkowsky (Amer. Medico-Surg. Bull., July, '93).

Acute Alcoholic Mania (Mania a Potu).

Symptoms.—The patient, in wild, ungovernable fury, shouts, stamps, strikes, or kicks, and is, for the moment, uncontrollable. The eyes roll, the face is flushed, and the veins distended and engorged; the muscles are at their highest point of tension and are in continuous violent action. The pulse is strong, bounding, and tumultuous. Though mechanically conscious, the subject is filled with "blind fury." He is carried away in a tempest of nervous excitation and passion. The paroxysms of violence sometimes last only a few minutes, at other times for from an hour to several days with quiet intermissions. Rarely are there delusions, though the infuriated subject may vent his violence on the first animate or inanimate object in his way. In a few cases the fury is directed against a certain person or thing. Violence is succeeded by calm; a few minutes after a storm the temperature is normal, and during the paroxysm rarely raised. In some constitutions a paroxysm may be provoked by a small quantity of alcohol.

Differential Diagnosis.—It may be differentiated from delirium tremens by the absence of tremors, terror, hallucinations, delusions, the white tongue, nausea, and the delirium of the latter. Further, mania a potu may arise from a small quantity of an intoxicant taken in a short time, while delirium tremens is due to large quantities taken in rapid succession, or from smaller quantities long continued.

Etiology and Pathology.—Alcoholic mania is occasionally seen in chronic inebriates, and most frequently in periodic tipplers. In the latter it often occurs when, soon after an interval of abstinence an intoxicant is freely partaken of. Some chronic inebriates invariably suffer acute mania if they drink a single glass of spirits, wine, or beer beyond their usual allowance. The paroxysms of acute mania resemble those of epilepsy, and a large proportion of police-court drunken offenders are patients of this class. The symptoms are evoked by the pathological action of acute poisoning by alcohol, in nervous systems liable to such excitation, either congenitally or from the effects of intemperance, traumatism, or brain-tire.

Prognosis.—The prognosis is much more favorable than in acute mania, the paroxysm usually rapidly passing away, leaving the patient exhausted and peace-

ful. Rarely is there relapse unless alcohol be again taken.

Treatment.—Little treatment is generally needed. Non-alcoholic liquids, such as milk, iced milk, milk and soda, or saline draughts with ipecacuanha and small doses of the bromides are sufficient to bring about recovery. Sometimes cold affusions and, in prolonged paroxysms, wet packs prove valuable adjuncts.

When violent mania is present, apomorphine, $^1/_8$ to $^1/_6$ grain, hypodermically, causes nausea and vomiting and rapid removal of the violent symptoms.

> Study of 958 cases of alcoholism, of which 40 suffered from acute excitement, or mania a potu.
>
> No stimulants given in any case. The uniform prescription was 30 grains of bromide of potassium every two hours in maniacal cases, and every three or four hours in other cases. In cases of noisy mania, ¼ grain of morphia sulphate was occasionally given hypodermically at bed-time. All the cases recovered. Latimer (Johns Hopkins Hosp. Bulletin, No. 119, '91).

Chronic Alcoholism.

Symptoms.—The intensity of the symptoms corresponds with that of the functional and organic disorders produced. In average cases the earlier symptoms are those indicating nervous disorder, the most important being muscular tremor. The hands are unsteady and shake; but, in the majority of carefully examined cases, the lower limbs are found to be affected before the upper (particularly in females). The trouble is especially marked in the morning, and may be such as to render the use of the limbs difficult. At first an effort of the will enables the patient to control the movements of his hands and feet, but this power gradually wanes.

Restlessness, the limbs starting involuntarily, especially after retiring, is the first indication of impending trouble in some tipplers. The mind becomes irritable; there is headache, dizziness, tinnitus aurium and muscæ volitantes, while flashes of light are frequently complained of.

Besides the irritability there is usually mental disquietude, the patient being unable to settle down to his duties. He frequently labors under the apprehension that bodily harm is awaiting him, whether through the act of some enemy, an accident, or illness he cannot tell. In walking he experiences at times the sensation of falling down a precipice,—a bad omen, according to Anstie. As the disease advances the chronic alcoholic is apt to become a prey to delusions of suspicion, while a prominent feature is what may be designated "narcomaniacal untruth," the confirmed sot asseverating that he has drunk no liquor even when seen in the act.

> Delusions as to locality are a prominent symptom in chronic alcoholic mental derangement. Mason (Quarterly Jour. of Inebriety, July, '92).

Pains around the limbs—especially at the wrists and ankles, the shoulders, along the muscles of the spine, and down the spine proper—are common. These pains are intermittent and paroxysmal, usually appearing late in the day or after prolonged exertion, according to the fatigue to which the patient has been exposed. These neurotic and muscular pains were at one time credited to rheumatism.

> [Henry Monro narrated the cure of a number of cases of what he supposed to be alcoholic rheumatism, by the simple withdrawal of alcoholic liquor. The cases were most probably alcoholic multiple neuritis at an early stage. Norman Kerr.]

Besides the disorders of locomotion attending muscular inco-ordination, there may be impairment of sensation

The lower limbs are frequently found wasted, while the abdomen is found enlarged and, perhaps, pendulous, owing to the presence of adipose tissue. Epileptiform convulsions are occasionally observed, while mania, melancholia, and dementia are frequent sequelæ.

Gastric disorders may be present early in the history of the case. Nausea and vomiting are common; these usually occur in the morning, and have been known to extend to hæmatemesis and death.

> Case of profuse and fatal hæmatemesis consequent upon chronic alcoholism. Hancock (Med. Chronicle, May, '91).

The appetite is absent for the breakfast in almost all advanced cases; the tongue is coated, and the breath usually very foul. A sensation as if the stomach were sinking is a frequent symptom,—an important one in that it usually prompts the patient to drink to obtain temporary relief.

The eyes are congested and watery, the features expressionless. The skin of the face is red and frequently papular,—a condition known as "acne rosacea" (*q. v.*). The latter diseases does not occur only in drunkards, however, functional gastric and menstrual disorders being active as etiological factors in perfectly temperate people.

> [Indeed, the most aggravated and obstinate case of "acne rosacea" which I have ever seen was a merchant whom I have known to have been a strict abstainer for some fifteen years. NORMAN KERR.]

The chronic alcoholism of ardent spirits (whisky, brandy, and gin especially) has a distinguishing characteristic of emaciation with shrunken, though fiery or bluish, countenance, while that of malt intoxicants and sweetish wines (particularly if not alcoholically very strong) exhibits usually a generally bloated appearance, with adipose superabundance.

Differential Diagnosis.—In most cases the alcoholic history, with the symptoms, easily discriminate chronic alcoholism. Among the latter, especially morning nausea, or sickness; foul ethereal breath; furred tongue, eructations, gastralgia and gastrodynia, anorexia, and cephalalgia; diarrhœa or, more generally, constipation; tremors, restlessness, fear. In advanced stages bloated, puffy, or pinched features; shuffling, ataxic gait; listlessness, perverted sensations, and untruth. In alcoholically paralytic cases the paretic symptoms are antedated.

> Drunkenness should be discriminated from inebriety. Drunkards drink when they have the opportunity; inebriates are diseased persons who drink when their attack seizes them. The drunkard may so injure his brain, structurally or functionally, that he may become an inebriate; the inebriate, however, is one who is generally born with an unsound brain. This is a transmissible cachexia. The child of an inebriate, born after the lesion has been established, inherits some nervous diathesis. The only security is by life-long abstinence on the part of the child. Stewart (Lancet, Jan. 9. '92).

Etiology.—Heredity has, by most authorities, been considered to be the chief predisposing influence. Crothers traced a family history of inebriety in one-half of his cases, besides 25 per cent. of defective brain-states from a neurotic or other morbid inheritance inclusive of insanity.

> [In over 3000 cases I have found fully one-half with an inebriate ancestry, in addition to 6 per cent. with a pedigree of mental disease. Almost the same proportions have been the experience of the American, Fort Hamilton, and the English Dalrymple Homes. Bevan Lewis attributed 64 per cent. to parental inebriety, some form of transmitted neu-

rosis, or insanity. Piper, likewise, puts the proportion of hereditary to acquired cases at two to one. In my opinion, the number of cases in which an ancestral history of alcoholism has been traced is much below the actual amount, as it is frequently difficult to get relatives to admit the existence of an alcoholic taint. NORMAN KERR.]

Heredity is said to be crossed when, in its single parental form, the children of the opposite sex to the inebriate parent only are affected. An important fact is that all these and other forms of alcoholic transmission may be handed down by a parent or parents who have never been known to have been intoxicated, or to have exhibited any uncontrollable impulse to intoxication.

Double parental alcoholism causes alcoholism; absinthism causes epilepsy; and combination of absinthism and epilepsy a common cause of epilepsy in children. Legrain (Brit. Med. Jour., July 20, '95).

The proportion of hereditary cases has increased 50 per cent. over the acquired during the past twelve years. Holmes (Med. Pioneer, Aug., 95).

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Neurotic intemperance possesses features which serve to distinguish it from the common vice of occasional and deliberate drunkenness. Whereas the *vice*, once so prevalent and even fashionable among the men of all classes, is now all but confined to what are called the lower orders, the *disease* is confined to no class, and to neither sex, and instead of diminishing seems decidedly on the increase. The occasional drunkard seeks companionship in his cups, and is generally more or less noisy and uproarious in his intoxication; but the victim of this disease inclines rather to shrink from observation, and is generally quiet and morose under the influence of alcohol. J. Strachan (Brit. Med. Jour., Oct. 1, '98).

Careful study of four hundred alcoholics has been made during the last fifteen years at Zurich, under Forel's supervision, and again the fact of heredity is emphasized. Forty-three per cent. of the cases had one or both parents alcoholic, and 40 per cent. of the parents were wholesale or retail dealers in liquors. One hundred and thirty-two, out of three hundred and forty-six, had become alcoholics without drinking liquors, consuming merely beer, wine, or ciders. Alcoholism is most frequent between 20 and 60 (93.5 per cent.). Below that age a case is most sure to be direct heredity. All the cases showed various physical, mental, and moral alterations; degeneration of heart, arteriosclerosis, affections of the stomach, tremor, ataxia, pupillary troubles, general denutrition, etc. One-fifth were sexual perverts (hyperæsthesia, precocious debauchery, inversion). Fourteen per cent. were epileptics; in six cases the attacks followed alcoholic excess and disappeared entirely when the patients refrained from alcohol. Editorial (Quart. Jour. of Inebriety, Jan., '98).

Alcoholism and evil disposition, with criminal tendencies, are ascribable to heredity, according to Moreau. It has generally been found that the major portion of inherited alcoholism is due to the alcoholism of one or both parents.

[This may be estimated at nearly two-thirds, after an examination of the records. NORMAN KERR.]

The transmissibility of an alcoholic inheritance has been very generally admitted, among other writers by Plutarch, Aristotle, Darwin, Rush, Morel, Lancereaux, Grenier, Magnan, Day, Wright, Mason, Carpenter, Thompson, Richardson, Forel, and Demme.

Alcoholic heredity may be divided into single or double, mediate (parental) or immediate (grandparental, etc.), homogeneous (transmitted as alcoholism) or heterogeneous (transmitted as some other neurosis).

An innate tendency to alcoholic excess has been observed in children of tender years,—from two years old and

onward, by Barlow, More-Madden, Langdown Down, Kerr, and others.

[I have observed children, born more than a year after the father had been attacked by brain disease or inebriety, exhibit from their earliest years a propensity for intoxication. In more than one family, though the offspring of the paternal post-disease, the child or children could, only with constant supervision, be kept from strong drink as soon as they began to crawl. NORMAN KERR.]

Case in which three boys, born of a strictly temperate father, also became temperate men, while a fourth, younger boy, who died of drunkenness at 41, was born ten years after the same father had become a drunkard. Schaefer (Times and Register, May 21, '92).

Of the various transformations of the alcoholic inheritance seen in children, insanity takes a leading place.

Large percentage of insane children in Germany due to habitual drinking. Alcohol produces *acquired* insanity by acting as exciting cause, and *hereditary* insanity by causing organic changes, which are transmitted to descendants. Habitual drinking is most detrimental to offspring. Rust (Med. Pioneer, Aug., '95).

Examination of two groups of 10 families each in a children's hospital. One group of 57 was affected, more or less, by alcohol; the other of 61 was unaffected, or slightly so. Of the first group 20 had inebriate fathers, the mothers and grandparents being moderate drinkers. Only 45 per cent. of these had healthy constitutions; 31 had inebriate fathers and grandfathers, but temperate mothers and grandmothers; only 2 of these, or a little over 6 per cent., were healthy. Of the 61 children belonging to temperate families, 82 per cent. were in good health. Demme (Brit. Med. Jour., Sept. 27, '90).

Among 819 descendants of 215 alcoholic families there were 121 premature deaths, generally from convulsions, 38 cases of physical debility, 55 of tuberculosis, and 145 of mental derangement. Among the remainder were many cases of epilepsy, hysteria, idiocy, etc. Legrain (Med. Press and Circular, June 13, '94).

The generative cells of drunkards alcoholized and their children are degenerates; their resisting-force against alcohol is thus diminished. Evolutionary adaptation of mankind to alcohol is impossible. Fürer (Le Bull. Méd., Aug. 25, '95).

Experimental dosing of hens' eggs with alcohol delays and modifies development, monstrosities and anomalies resulting. Féré (Jour. de l'Anatomie et de la Physiologie Normales et Pathologiques de l'Homme et des Animaux, Mar., Apr., '95).

When double parental alcoholism is of sufficient duration to induce nerve-central organic disturbances, a weekly mind in the offspring is inevitable. Wilkins (N. Y. Med Jour., Sept. 22, '94).

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Report of 141 cases of idiocy, epilepsy, dementia, etc., directly traced to alcoholic parentage and demonstrating the alcoholo-neuropathic heredity of the drink-crave, the drink-habit, and the drink-vice, and *vice versâ*. Sollier (Alienist and Neurologist, Apr., '97).

Sex.—The proportion of females as compared to that of males has, until recent years, probably been, on an average, about one woman to six men. But during the past fifteen years or so there has been an enormous increase of chronic alcoholism among females, especially in England, France, and the United States, though a considerable increase has been observed in other countries. The disease seems to be more inveterate in them than in males.

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Out of 500 patients treated in the out-door department of the Laennec Hospital, in Paris, 156 were females presenting symptoms of chronic alcoholism. Grandmaison (British Med. Jour., Apr. 16, '97).

In more than two hundred female inebriates, the author has not been able

in any way to reform more than 10 per cent. of them, the results being less favorable than in the case of male drunkards. I. N. Quimby (Boston Med. and Surg. Jour., Oct. 28, '97).

Age.—As a rule, about one-half the whole number have occurred between 40 and 50, though there has been an increase in adolescent life, from 18 to 25, these younger chronic alcoholists specially developing an homicidal maniacal tendency (as noted by Magnan, in Paris). Even boys of 7 years and upward having been treated for delirium tremens and chronic alcoholism in England, and children are sometimes sent drunk to school in Austria.

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The use of alcohol by children is one cause of the depopulation of France. The conclusion reached is that it is as dangerous as is an excess of alcoholic beverages for an adult; for the adolescent they are deadly, because they cause organic changes, hinder physical development, and impair the normal faculties even to the extent of degeneracy. For these reasons, then, alcohol should be proscribed as drink for children. Lancereaux (Jour. des Praticiens, No. 42, p. 665, '96, second series).

[I have known cases originating over 70 and even over 80. There is an inebriate climacteric, beyond which period nervous periodicity, energy, and function fail in response to alcoholic excitation, placed by Parrish at between 40 and 50, and by Kerr 15 years later in life, between 55 and 65. NORMAN KERR.]

Religion. — Brahmanism, Buddhism, and Mohammedanism predispose against alcoholism more than other religions.

Race.—Eastern peoples, generally, are more susceptible than Western to alcoholism. The latter (also some savage races), with their intenser energy, take to alcohol more impulsively and die sooner from it. The Jewish community possesses a striking racial inhibition which has largely contributed to their marked general freedom from alcoholism.

Atmospheric and telluric conditions predispose a substantial number of persons to alcoholism. The form of the alcoholism is to some extent modified by atmosphere and climate.

Education.—In civilized communities culture and refinement endow many individuals with a more delicate susceptibility to alcoholic poisoning.

Occupation.—Occupations with a depressant or exciting influence on the nervous system predispose to alcoholism.

Marital Relations. — Between single and married males there is little difference, but, in women, the proportion of spinsters is only one to from four to six married, widowed, or divorced women.

Temperament.—The nervous and sanguine temperaments are, by far, the most susceptible to alcoholic toxication; the phlegmatic rarely yielding.

Associated Habits.—Though the bulk of the subjects of alcoholism are smokers or users of tobacco in some form, the popular idea that tobacco-use largely predisposes to alcoholism seems to be without foundation.

[I have seen only a very few such instances. Only to a limited extent does any other narcotic, such as morphine or cocaine, act as a predisposing influence. NORMAN KERR.]

Diseases and Injuries.—In no inconsiderable number of cases syphilis predisposes to chronic alcoholism. Phthisis, gout, rheumatism, malarial poisoning, the neuroses, diabetes, and other ailments exert a similar influence. Injuries and sun-strokes, head-lesions, and heat-apoplexy often leave mental impairment and inability, which induce susceptibility to take on alcoholic narcotic disturbance and addiction.

An intelligent and educated woman never becomes a drunkard but from some deep-rooted and often carefully-concealed cause, which may be physical or mental. Lawson Tait (Brit. Med. Jour., Oct. 15, '92).

Diet.—Improper, defective, and badly-cooked food, with bad hygienic conditions, frequently act as predisposing factors. A considerable degree of alcoholic predisposition, in the person of the regular, limited drinker and his progeny, is the direct effect of chronic alcoholic poisoning. The gradual alcoholic paralysis of inhibition induces a lessened capacity to resist the narcotizing action of the alcohol.

Most of these influences operate also as causes exciting to intoxication. In addition, there are nerve-shock in both sexes, the functional crises of puberty, menstruation, pregnancy, maternity, lactation, and the menopause of women, monotonous dullness, and medical prescribing. Nerve-shock of some kind probably accounts for from a seventh to a sixth of chronic alcoholics.

[In my experience about 2 per cent. of cases have arisen from head injuries immediately after the excitation consequent thereon; and ½ of 1 per cent. from alcoholic intoxicants medically prescribed. Alcoholic drinks and proprietary preparations containing alcohol are also taken or given as a "remedy" or "medicine" under non-medical advice, by nurses and other unqualified persons. NORMAN KERR.]

A common assertion is that doctors' prescriptions are one of the chief causes of drunkenness. In a study of the subject in over 3000 cases of inebriety, I was unable to trace the initiation of the alcoholism as due to medical prescription in more than ½ per cent.

Pathology.—*Protoplasm.*—The experiments of Dogiel, B. W. Richardson, and others indicate that alcohol, even in very small quantities, affects protoplasm, and therefore the entire system. It tends to cause cessation of the amœboid movements of the white blood-corpuscles, and, through this, increases the liability to suppuration and the sluggish reparative action observed in drunkards. Its general effect is to inhibit vital phenomena inherent in the protoplasm, hindering thereby the resistance of the body to infectious diseases, while the multiplication of various bacilli in the presence of even minute quantities of alcohol would seem to indicate that the life and growth of destructive elements are promoted. The blood is improperly aërated and waste material is unduly retained in the body.

Alcohol lessens the absorption of oxygen by the blood-corpuscles and the exhalation of carbonic dioxide. Every function of the body is thereby affected. Prout, Edward Smith, Harley, Schmiedeberg, Vierordt, Kerr, and others (Med. Pioneer, Oct., '95).

The continual ingestion of alcohol causes atrophy of elementary organisms, tending to destroy cellular protoplasm and vitality. Gaule (Le Bull. Méd., Aug. 25, '95).

The walls of cells inclosing germinal matter are dissolved, free albumin is coagulated, red globules are deprived of part of contents, leaving them shrunken; growth of tumors favored, metabolic action limited, organization of neurodynia of gray matter reduced or prevented. Wilkins (N. Y. Med. Jour., Sept. 22, '94).

Even in minute quantities alcohol favors the growth of many pathogenic organisms, including those of pus and diphtheria. Ridge (Med. Pioneer, Oct., '95).

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Alcoholized animals not only show the effects of inoculations earlier than do non-alcoholized rabbits, but, in the case of the streptococcic inoculations, the lesions produced are much more pronounced than are those that usually

follow inoculation with this organism. A. C. Abbott (Jour. of Exper. Med., vol. i, No. 3, '96).

Cases showing marked inhibitory influence of alcoholism on the growth of children. Lancereaux (La Presse Méd., Oct. 14, '96).

Stomach.—The interior of the stomach presents a dark bluish-red hue, sometimes looking very fiery and angry; while ulcerative erosive patches, thinning of muscular coat, with an increase of connective tissue and atrophy of gland-cells, are also conditions usually observed. In malt-liquor chronic alcoholists there is dilatation. The irritation of the gastric mucous membrane hinders digestion, and thereby interferes with the nutrition of the patient.

Autopsy of nineteen inebriates. Five showed inflammation of the stomach alone. In two of these the mucous membrane of the stomach was black and thickened, and in places ulceration had taken place. Of the other seven, three had suffered from both gastritis and enteritis, while the remaining four had suffered from extensive inflammation of some part of the intestinal canal, a majority of them suffering from colitis. A remarkable feature in these twelve gastro-intestinal cases was that everyone had, at some period of their lives, suffered from pleurisy or pleuro-pneumonia, for pleural adhesion existed in every case. Carpenter (Western Med. and Surg. Reporter, Jan., '91).

Digestion.—The irritation of the gastric mucous membrane hinders digestion. Alcohol impairs all the gastric functions, and thus interferes with the general nutrition.

Experiments on five young men: Alcohol used in a 25- and 50-per-cent. solution, of which 3½ fluidounces were taken ten or twenty minutes before the patient's dinner (consisting of soup, cutlet, and bread). Conclusions: 1. During the first three hours after the ingestion, the gastric digestion is markedly retarded, and dependent upon a decrease in the proportion of hydrochloric acid. 2. The diminution is especially pronounced in persons non-habituated to the use of alcohol. 3. Stronger solutions of alcohol act more energetically than weaker ones. 4. During the fourth, fifth, and sixth hour after the meal, the digestion becomes considerably more active, the proportion of hydrochloric acid markedly rising. 5. Under the influence of alcohol, the secretion of the gastric juice becomes more profuse and lasts longer than under normal conditions. 6. The motor and absorptive powers of the stomach, however, are markedly depressed, the decrease being directly proportionate to the strength of alcoholic solutions ingested. 7. Alcohol distinctly retards the passage of food from the stomach into the duodenum. 8. On the whole, alcohol manifests a decidedly unfavorable influence on the course of normal gastric digestion. Even when ingested in relatively small quantities, the substance tends to impair all gastric functions. 9. Hence, an habitual use of alcohol by healthy people cannot possibly be approved of from a physiological stand-point. Blumenau (Inaugural Dissertation, No. 17, p. 60, '90).

Ptyalin of saliva and pepsin precipitated; gastric vasodilators paralyzed, while the constrictors are stimulated, preventing flow of gastric juice and accounting for irritability, anorexia, etc. Stomach inflamed and covered with thick mucus. Duodenal and pancreatic function prevented. Stearin dissolved out of the fat by alcohol, remaining elements contributing to fatty degeneration of various organs. Excessive use continued any length of time prevents rehydration of glycogen and its transfer to the blood, and oxygenation of bilirubin to form biliverdin. In this sense, even a small quantity of alcohol is inimical to life. Wilkins (N. Y. Med. Jour., Sept. 22, '94).

[Sir William Roberts's view, that we are, as a rule, suffering not from slow, but from too rapid, digestion, and that we therefore need alcohol, not to aid digestion, but to hinder it, can hardly be accepted. Clinical observations of

performance of digestive function in living human subjects does not exhibit, as a rule, improved digestion after the administration of alcohol. NORMAN KERR, Assoc. Ed., Annual, '96.]

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It would appear, from a study of many cases, that, so far, no general rule can be found, and each case must be studied from the facts of its history. Thus, in some cases, a meat diet is literally poisonous, and its removal is the first essential for a cure. Again, a grain or fruit diet is clearly injurious, and more rapid recovery follows a change. In all cases states of starvation and auto-intoxications exist the removal of which conditions may be of equal importance to that of alcohol. The study of the diet brings out many unsuspected causes which require removal and treatment before a cure can be effected. Editorial (Quarterly Journal of Inebriety, Oct., '97).

Liver.—The liver is frequently affected by one of the various forms of cirrhosis. The proclivity of each individual bears considerable influence upon the development of this disease, however. The other hepatic chronic disorders most apt to be encountered are fatty and nutmeg liver. Acute hepatitis is less frequently met with.

Experimental alcoholism in animals causes preliminary gastric catarrh, then fatty degeneration of the liver. Koulbine (La Méd. Mod., Jan. 16, '95).

The lesions found in the acute form of alcoholic hepatitis are like those observed in infectious, suppurative hepatitis, showing the identity of effects between infectious and toxic processes. Pilliet (La Tribune Méd., Apr., '90).

The ascites of cirrhosis is habitually absent in connection with the cirrhotic alterations of the liver in the alcoholic insane. Klippel (Annales Médico-psychologiques, Sept., Oct., '94).

Case of acute alcoholism in which the hepatic functions were suppressed during twenty-one days. Cassaët (Le Bull. Méd., Oct. 31, '94).

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Histological examination, in two rabbits which were subjected to progressively increasing doses of wine. There were traces of an irritating influence upon the liver, which were found principally in the central parts of the lobes. The connective tissues of the portal spaces did not present lesions that were very clear, but the subhepatic veins and the capillaries were filled with leucocytes and proliferated endothelial cells. The glandular parenchyma was remarkable for the considerable size of its nuclei, which were vesicular; the cellular protoplasm seemed to be intact. One had died at the end of twenty days, without presenting any visceral alterations. The other had died after thirty days, and presented hæmorrhage of the stomach. The liver was of a pale-grayish color and the spleen was tumefied. Lancereaux (La Presse Méd., Oct. 14, '96).

With the above conditions is often associated a special facies, consisting in watery, blood-shot eyes, sometimes yellowish from bile, and in enlarged venules on the nose and cheeks; at times, acne rosacea.

At an early stage the eyes of chronic drunkards present the following symptoms: Catarrhal conjunctivitis, congestion of the iris, spasm of accommodation, contracted pupils, photophobia, nyctalopia, a glimmering sensation in bright light, scotomata, amblyopia, and partial atrophy of the optic nerve. (May.)

Pancreas and Intestines.—The interference presented by alcohol to the proper digestion of fats is mainly responsible for the fatty degeneration of the heart and other organs generally encountered at autopsies. The pancreatic secretion being coagulated by the alcohol, the fat is not emulsified.

Although the coagulated secretion is redissolved into its former elements by pure water, it is impossible to restore it in the presence of alcohol, as there is a mixture of water and alcohol in which the secretion will not dissolve. The stearin of the fat is dissolved by the alcohol out of the fat-globules. This dissolution is probably aided by the duodenal secretions. The remainder of the fat becomes a foreign body in the circulation and, being a compound of palmitin and olein only, does not possess the property by virtue of which it is attracted to the adipose vesicle, but is deposited in the different tissues, cavities, and organs, thus constituting fatty degeneration. Wilkins (New York Med. Jour., Sept. 22, '94).

The intestinal tract bears the brunt of the irritating action of improperly digested food, and gastro-intestinal trouble is frequent, especially in children.

The ingestion of alcohol causes migration of microbes from the intestines to the peritoneum and to the blood of the vena porta. Wurtz and Hudelo (Le Bull. Méd., Jan. 30, '95).

Many infants suffering from acute or subacute gastro-intestinal disease are the victims of unrestrained administration of whisky or brandy, no definite direction having been given as to dose. Henry Koplik (Med. Pioneer, Feb., '94).

Kidneys.—The structural definition of the kidneys is frequently lost in advanced cases. Their functions are interfered with, and cumulation of products of metabolism is imposed upon the system. The various forms of nephritis are natural consequences of the irritation produced.

Uric-acid and calcium-oxalate crystals are found in the urine of persons in good health after taking alcoholic drink, besides an increased number of leucocytes with cylinders and cylindroids. It may, therefore, be concluded that, even in moderate quantities, alcohol irritates the kidneys, the augmented leucocytes, cylinders, and crystals being due either to the increased metabolism of the tissues or an alteration by alcohol of the relations of solubility of the urine salts. After a single indulgence this action lasts for thirty-six hours. But continuation is cumulative. Glaser (Quarterly Jour. of Inebriety, Apr., '92).

First and most frequent effect on kidneys is polyuria, then diabetes insipidus, followed by diabetes mellitus in predisposed alcoholics. Wilkins (N. Y. Med. Jour., Sept. 22, '94).

There is a true diabetes, in which an affection of the liver is found preceding by a long period the diabetes, and to which the diabetes is due. These patients have been considered until now as suffering merely from diabetes, and not from the liver, since an examination of the liver was necessary in order to recognize them as suffering from that organ. The alternate phases of amelioration or the contrary in the diabetes coincides with the development of the process in the liver; it may be recognized by the changes in the volume, form, density, and sensibility of the liver.

Of six cases seen by the author, there were three in which diabetes with hypertropic liver had existed for years who suddenly developed a cirrhosis, while the polyuria, glycosuria, and thirst vanished, to be replaced by atrophy and cirrhosis of the liver. Glénard (Mercredi Méd., No. 44, '94).

Heart.—The heart-failure of chronic inebriates has for the past quarter of a century been continually presenting itself in my experience, often preceded by, or contemporaneous with, dilatation of the muscle. Alcohol has a direct action on the involuntary muscular system, and the heart is more responsive to its dilating action than any other part of the bodily structure.

Dynamometer shows that the muscular strength is diminished under influence of even moderate doses of alcoholic drinks. Fürer (Le Bull. Méd., Aug. 25, '95).

The three cardinal symptoms of heart-failure are generally observed early in alcoholic cases, though the prognosis is

good providing alcohol be abandoned as soon as the immediate therapeutic necessity for its use has ceased. Graham Steele (Med. Chronicle, Apr., '93).

The heart is fatty and covered in parts by fatty tissue. It is usually flabby, pale, and antemortem clots are likely to be formed in the cavities. These conditions predispose to sudden death.

Alcoholic myocarditis, with consecutive hepatic disturbance and temporary albuminuria, is found as a clinical form in men of middle age, between 25 and 50 years; in women it is much more uncommon. In all cases abuse of alcoholic drinks may be looked upon as the cause. It begins slowly and progressively. The first symptom consists in dyspnœa, when the patient speaks or goes upstairs, later during walking. Fragmentary myocarditis is found anatomically. An increase in the size of the liver is added to the dilatation of the heart. The kidney is finally affected. Aufrecht (Deutsche Archiv f. klin. Med., vol. liv, p. 615, '95).

Blood-vessels.—There is general arterial dilation with atheromatous thickening and brittleness, due to a cribriform condition resulting from the aneurismal dilatation. The motor cells are enlarged and pigmented, and their processes are covered with nuclei.

Case of œsophageal varicose veins in a chronic alcoholic subject who died from frequent and severe hæmatemesis. The varices ascribed to the direct effect of alcohol on the intima of the veins. Letulle (La Semaine Méd., Oct. 22, '90).

It paralyzes the vasoconstrictors and, at times, vasodilators of capillaries, causing local hyperæmia and stasis. Hypertrophy results from vasoconstrictor paralysis, and atrophy from vasodilator paralysis. Wilkins (N. Y. Med. Jour., Sept. 22, '94).

Lungs. — Chronic alcoholism, by lowering the condition of the system, renders more liable to both acute and chronic tuberculosis. Pleural adhesions and other evidences of active processes are frequently seen.

One of the most efficient prophylactic measures against tuberculosis would be the repression of alcoholism. Thorain (Revue des Sciences Méd. en France et à l'Etranger, July 15, '94).

The two most common causes of tuberculosis are troglodytism and alcoholism. Tison (Jour. d'Hygiene, Aug. 30, '94).

Post-mortem examinations of phthisical cases at St. Thomas's, London, showed that in 75 cases there was a strong history of alcoholism. In only 10 of these was there any history of inherited phthisis; in 46 (or over 60 per cent.) the liver was cirrhotic. Mackenzie (Brit. Med. Jour., Feb. 27, '92).

Alcoholic excesses one of the main causes of tuberculosis by predisposing the system to bacillary action. The phthisis of drunkards presents peculiar characteristics in localization and evolution: the lesion, instead of being in left apex in front, is located at the right apex toward the back. Improvement usually follows the first attack, and recovery frequently ensues if the alcoholic habit is corrected. If continued, the disease suddenly assumes alarming character, involvement of both lungs, peritoneum, and meninges quickly causing death. Lancereaux (Le Bull. Méd., Mar. 6, '95).

The increase of tuberculosis is proportionate to that of alcoholism in France. Lagneau (Le Bull. Méd., June 26, '95).

In 30 cases of chronic alcoholism in which phthisis was present, a dense, fibroid, pigmented change was almost invariably present in some portion of the lung far more frequently than in other cases of phthisis; gray or yellow tubercles were less common, and caseous broncho-pneumonia was quite the exception. Tuberculous lesions are not infrequently associated with alcoholic neuritis and hepatic cirrhosis. Pitt (Brit. Med. Jour., Jan. 14, '91).

Brain and Nervous System.—The meninges are often adherent and show inflammatory white patches and thickening. The brain is shrunken, with flat-

toned, narrow convolutions and serous, ventricular, and subarachnoid effusion. There is general wasting of nerve- cells and fibres, with atrophied, tangled nerve-centres and great increase of connective tissue. In the brain-substance congestive bleeding-points are sometimes observed on section. Scavenger calls are met with in profusion, preying on nerve-elements. (Bevan Lewis.)

Mental disorders and crime are shown, by statistics, to have, in alcohol, one of their most potent etiological factors.

It is perfectly certain that from one-fourth to one-third of the lunacy of the United Kingdom is a result of the custom of drinking alcoholic liquors. J. J. Ridge ("Alcohol and Public Health," p. 63, '92).

Even small doses diminish intellectual power. A. Smith, Fürer (Le Bull. Méd., Aug. 25, '95).

The form of alcoholism is determined by pre-existing anomaly of subject; alcoholic psychopathia often the consequence of parental addiction; psychopathia and alcoholism cause one another. Fürer (Le Bull. Méd., Aug. 25, '95).

[A large share in the genesis of melancholia is due to agencies lowering the general health, among which alcohol is conspicuous. Farquharson found 11 per cent. of asylum cases of melancholia due to intoxicants, while many victims of suicidal melancholia who had no insane heredity had a family history of inebriety. Norman Kerr, Assoc. Ed., Annual, '96.]

Forty per cent. of crime and bad conduct come from inebriate parental degeneration. Corre (Quarterly Jour. of Inebriety, Jan., '94).

Women charged in American police-courts with drunkenness and associated offenses are profoundly degenerate in body as well as in mind. T. D. Crothers (Brit. Med. Jour., Dec. 31, '92).

In fifteen years lunacy has, in Paris, increased 30 per cent., due to the advance of general paralysis and alcoholic insanity. The latter is now twice as prevalent as fifteen years ago. Alcohol is responsible for a third of the lunacy cases at the Dépôt Infirmary, the tendency being more and more to homicidal mania in youths of barely twenty. Garnier (Quarterly Jour. of Inebriety, Apr., '92).

Poisoning by alcohol resembles poisoning by lead. The nervous tissue is specially exposed to the cumulative action of poisons in minute doses. Permanent consequences of the chemical action of alcohol on the easily-destructible nerve-tissue inaugurate imperceptible changes in the structure, which increase gradually and pass over to a permanently-diseased condition. Strümpell (Quarterly Jour. of Inebriety, Jan., '94).

Histological examinations have shown that alcohol causes swelling of the dendrites; this is followed by nuclear changes, then by degeneration of the cell-structures.

Examination of an alcoholic brain by the Golgi method. Lesions of the neuraxon of the nerve-cell slightly involving the cell-body and dendrites. Colella (Arch. Ital. de Biol., p. 216, '94).

Alcohol produces well-marked changes in the nerve-cells, especially in those of the anterior horns of the spinal cord and in the sympathetic ganglia. They first lose their chromatin structure, the fine granular appearance gradually being replaced by an homogeneous swelling. Golgi method. Vas (Archiv für exper. Path. u. Pharm., B. 34, p. 141).

There is gradual disintegration of the cell-body after the apical processes have suffered. Here and there, in the neighborhood of the cell-body, the protoplasm seems to become frayed or eroded. In other cases the cell-protoplasm becomes vacuolated from within until the entire protoplasmic structure is channeled by holes and seams of liquefaction. Golgi method. Andriezen (Brain, '94).

The literature of the past two years has demonstrated, more than that of previous periods, perhaps, the pathogenic influence of alcohol upon the brain. It has shown that, in proportion as it is used, so are mental disorders prevalent. the ratio of the increase of insanity cor-

responding to that of increased consumption of alcoholic beverages.

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Neurological and pathological evidence, together with recent experimental work, show that in the early stages of the insanities there is a profound nutritive and dynamical failure in the nerve-elements of the brain, which finds expression in the insomnias, the melancholias, and the commencing loss of memory, with easily-induced mental fatigue which their subjects experience, and that the pathological facts ascertained, in so far as they afford us any light, force on us the conviction that we are dealing with serious nutritive and dynamical changes in the central nervous organ. W. Lloyd Andriezen (Quarterly Jour. of Inebriety, Jan., '96).

Alcoholic excesses produce insanity. They are directly the cause of at least 10 or 12 per cent., and probably of a somewhat larger percentage; indirectly, they are among the causal factors of a very large proportion of cases that cannot be directly credited to alcohol. Moderate drinking is a very indefinite term, and this fact alone makes it impossible to utilize satisfactorily any statistics as to its effect in producing mental disease. There is, however, no reason to believe that moderate indulgence in alcohol is specially conducive to mental health in the average individual, and there is, on the other hand, a certain amount of physiological *à priori* presumption to the contrary. Bannister and Blumer (Amer. Jour. of Insanity, Jan., '96).

During four years, of 2169 patients received into the lunatic asylum at Rome, 340 (15.7 per cent.) owed their psychopathy to alcohol: 23 per cent. of the males, 4.6 of the females. Every form of mental disease to which alcohol may give rise is included in these 340 cases, all doubtful cases being carefully excluded. Tables showing that, as the production and consumption of alcoholic liquors in Italy generally have increased, the number of insane patients admitted to the Roman asylum for alcoholic diseases has grown. A. Volpini (Il Policlinico, '96).

Alcoholism contributed to the population of the asylums of France, in 1894, 775 patients: 624 males and 151 females. The forms in the males comprised 282 cases of alcoholic delirium, 332 of chronic alcoholism, and 10 of absinthism. The females included 90 cases of alcoholic delirium, 60 of chronic alcoholism, and 1 of absinthism. Besides these, if we take account of the cases in which excesses in drink caused the entry into the asylum of patients who, without this cause, would have been able to get on outside, we find further 166 males and 63 females. The two groups—simple alcoholic cases and the insane with alcoholic causation, a total of 1004 patients—give a percentage of 38.42 of the males and 12.82 of the females admitted. Thus, on the average, one-third of the insanity of the Department of the Seine is due to alcohol. Magnan (Progrès Méd., May 23, '97).

Out of 1900 male insane patients treated in the Municipal Asylum of Dresden during the last five years, 500 were clearly traceable to alcoholism. Luhrmann (Archives de Neurol., No. 15, '97).

In England drunkenness is increasing, not only among the poor, but also among the upper classes, and especially among women of all classes. Out of 442 male inebriates treated at the Dalrymple Home and discharged as cured, 101 were university men, and 316 of the remainder were well educated; 235 were married, and the others were widowers or bachelors. In 228 cases sociability was said to be the cause, ill-health caused the downfall in 36 cases, and overwork was given as the excuse for taking to drink in 32 cases. In 55 per cent. of the cases the excess was traceable to predisposing hereditary causes. About one-third of the cases treated are permanently cured. Out of the 442 patients discharged from the Dalrymple Home, 372 were kept trace of, and of these 149 were said to be entirely cured, 24 had improved, 164 had relapsed, 31 were dead, and 4 were insane. Editorial (Med. Record, Sept. 25, '97).

There are three types of cell-degeneration, viz.: (1) intense pigmentation of the larger cells, chiefly with degeneration of the cytoplasm; (2) a general cell-atrophy of the body and nucleus; (3) a great deal of change in the cell-body, with many neurogliar nuclei in the pericellular spaces. In the cases of alcoholism and alcoholic meningitis it was not possible to make out a distinct type of cell-degeneration, nor could this be expected, as these patients die, not so much from the alcohol, as from autotoxæmias and from the febrile process. Charles L. Dana (Med. News, May 1, '97).

Study by the Golgi method of the lesions produced by absolute ethyl-alcohol on the nerve-cells of the rabbit's brain, showing that this alcohol, considered as the least destructive of all its series, exerts a very definite and destructive effect upon the nerve-cell. Same degenerative changes found in the human being. Henry J. Berkley (Johns Hopkins Hospital Reports, vol. vi, '97).

Manner in which the pathological lesions and the symptoms correspond with one another: the sensory disorders, the exaggeration of the sensibility of the skin, the anæsthetic troubles, and the ocular and auditory disorders would correspond to the beginning of the vascular disorders, when the nerve-cells, irritated by an insufficient supply of proper nutriment, and excited by the presence of a poisonous stimulus, overact for the time; then, as nutriment is still withheld from them, altered metabolism results. The *beginning swelling of the dendrites of the sensori-motor region* is marked by paræsthetic symptoms, those of the purer sensory region by visual and ocular troubles, and some amnesia, especially for recent events; or, in other words, cells that have the function of evolving and transmitting thought cannot work properly, and defective memory results. Later, *as the motor cells are more and more involved and nuclear changes begin*, continuous tremor becomes apparent, the muscles no longer co-ordinate perfectly, unless for a moment under the direct influence of the will. Still later, *when a portion of the cell-structures have become highly degenerated and the altered cells have become more numerous*, the already tottering will-power becomes more and more deadened, memory and judgment fail, and, when the degenerative process is far advanced, an incomplete dementia is the final result. Henry J. Berkley (Johns Hopkins Hos. Reports, vol. vi, '97).

Beer.—Even under the excessive use of malt liquors, subjects rarely fail to put on fat. The blood shows an increased proportion of red and a diminished proportion of white corpuscles. Sudden cessation of drinking causes no other disturbances than a temporary longing, a rapid loss of flesh, and a decline in color. Stone in the bladder and cystic diseases are uncommon. Digestion is not retarded. Excess in beer is apt to produce subacute gastritis, especially in the summer. Cirrhotic kidney and hobnail liver are not found in beer-drinkers. Acute alcoholism is much more common than delirium tremens. (Lambert Ott.)

Four quarts of beer may be estimated to contain 240 grains of carbohydrates and scarcely 32 grains of albumin. Strümpell (Quarterly Jour. of Inebriety, Jan., '94).

The diminished vital resistance caused by the imbibition of alcohol renders the inebriate more liable to the development of disease than the temperate. Clinical experience has clearly sustained this view.

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Experience in India and other warm countries has indicated an extreme fatality from sun-stroke in persons using alcohol to excess. Fifty cases of sun-stroke brought into the Presbyterian Hospital of New York.

The use of alcohol seemed to have a direct unfavorable influence. The habit was marked in 32 per cent., moderate in 46 per cent., denied in 10 per cent.; in the remaining 12 per cent. no history

could be obtained. Eight persons were markedly alcoholic on admission, and of these four died. Editorial (Quarterly Jour. of Inebriety, Apr., '97).

Study of 247 recovered personal cases of delirium tremens: of these cases 202 were uncomplicated and 45 complicated by other diseases. Twenty-two cases were complicated by pneumonia, and when, also, the lethal cases observed by the author are taken in account, more than 12 per cent. of all cases of delirium tremens were combined with pneumonia. The delirium usually began on the fourth day of the pneumonia, but the evolution of the two diseases was individual, the one in no way influencing the other disease. Jacobson (Hospitalstidende, p. 143, '97).

The normal vital resistance of rabbits to infection by streptococcus pyogenes (erysipelatos) is markedly diminished through the influence of alcohol when given daily to the stage of acute intoxication. A similar, though by no means so conspicuous, diminution of resistance to infection and intoxication by the bacillus coli communis also occurs in rabbits subjected to the same influences.

While in alcoholized rabbits inoculated in various ways with staphylococcus pyogenes aureus, individual instances of lowered resistance are observed, still it is impossible to say from these experiments that, in general, a marked difference is noticed between alcoholized and non-alcoholized animals as regards infection by this particular organism.

It is interesting to note that the results of inoculation of alcoholized rabbits with the erysipelas coccus correspond in a way with clinical observations on human beings addicted to the excessive use of alcohol when infected by this organism. A. C. Abbott (Quarterly Jour. of Inebriety, Oct., '97).

Treatment.—The essential condition of cure is the entire discontinuance of all alcoholic beverages, whether spirits, wines, beers and other malt liquors, cider, etc. Records of reliable scientific hospitals and homes throughout the world show that, on an average, fully one-third of the cases so treated have been permanently cured.

Under scientific treatment one-third of inebriate patients are permanently cured. After an interval of from seven to ten years, in two thousand cases treated at Fort Hamilton, the proportion was 38 per cent. After eight to ten years, 35 per cent. of the survivors who had been discharged (numbering, in all three thousand) from the Washingtonian Home, in Boston, under Day, were temperate. Of two hundred and sixty-six who passed through the Dalrymple Home, in England, full 40 per cent. have kept firm. Crothers (Quarterly Jour. of Inebriety, Apr., '92).

Study of two hundred cases showing that, with the large majority, drunkenness is primarily a psychological disease, comprising (1) paralysis of the inhibitory power of the will; (2) a temporary amnesia; (3) a temporary effective and intellective modification of the personality. Wherrell (Medical Brief, Aug., '92).

Necessity of recognizing and treating inebriety as a disease. Moyer, Mayo, Angear, Mann, Baker, Chenery, Gray, Skeer (Times and Register, May 21, '92); Crothers, Marandon de Montyel, Ladame, and others; Kerr ("Inebriety," London).

Development of patient's will-power most important part of curative measures. Norton (Brit. Med. Jour., May 25, '95).

Brain-rest is important in many cases of periodical inebriety, which, in many instances, is an outcome of mental failure. T. D. Crothers (Va. Med. Monthly, Dec., '93).

Rest cure is recommended in alcoholism. Wharton Sinkler (Jour. of Nervous and Mental Dis., May, '92).

There is no specific. After treating the immediate symptoms of breakdown, delirium, etc., by flushing the intestinal canal and administering food and effervescents suited to the harassed and irritated digestive apparatus, the chief drug reliance should be on nerve-tonics, such as strychnine and nux vomica, combined

with cinchona, quinine, iron, chiretta, gentian, and calumba. Complications must also be attended to, as syphilis by mercury or potassium or sodium iodide, and ague by quinine, bebeerine, or arsenic. The indications are to prevent the alcoholic poisoning going further, by the immediate withdrawal of alcoholic beverages, which superabundant experience—in prisons, workhouses, hospitals, and homes for the treatment of the disease of alcoholism—has shown to be quite safe; to antagonize or remove the exciting causes; and to reconstruct healthily body and brain. The highest influences of art, intellect, morals, and religion should be invoked to restore inhibition and re-establish the lost will-power. Massage, galvanism, muscular exercise, especially in the open air, working at a congenial occupation, bathing (including the Turkish or Roman bath), with all healthful and invigorating hygienic exertions, are useful adjuncts to medicinal therapeusis.

> The bath is applied with advantage to promote elimination, restore natural function, and quiet irritated and inflamed organs. Patients debilitated from acute inflammation and pain have enjoyed the bath twice daily for months. Shepard (Jour. Amer. Med. Assoc., Jan. 9, '92).

The peculiarities of each case should be studied, and it is important to instill into the alcoholist's mind the necessity for life-long abstinence from the toxic substance, just as in chronic lead or arsenic poisoning, with both of which intoxications alcoholism has much in common.

Strychnine hypodermically has been recommended. The nitrate or sulphate is usually administered in doses of $^1/_{30}$ to $^1/_6$ grain daily, or oftener, as indicated by the gravity of the case.

> Strychnine rapidly and distinctly augments excitability of motor area of cortex previously depressed by alcohol in animals. Runkewitch (Universal Med. Jour., Nov., '95).
>
> History of twenty-five cases of alcoholic mania treated with nitrate of strychnine subcutaneously injected. The dose varied from $^1/_{30}$ to $^1/_6$ grain twice daily for ten days, then once daily for ten days, the highest dose being reached about the third or fourth day and continued to the close of the treatment. This administration is in accord with Spitzka's experiments, that to maintain its action the doses of strychnine must be at first increased; later the interval increased and the doses lessened. The border-line of tolerance was reached, in most cases, when 15 minims were used of a solution containing 2 grains of strychnine nitrate to 4 fluidrachms of water,—equal to $^2/_{15}$ grain. Internally, cinchona, peroxide of hydrogen, and capsicum were frequently prescribed in combination. When sodium bromide failed to procure sleep paraldehyde always succeeded. In the latter case, strychnine, in doses of $^1/_{20}$ grain, with elixir of phosphates and calisaya, was ordered to be taken once or twice daily for four to five weeks after ceasing the injections. There were fourteen relapses known in these twenty-five cases from within one to eleven months. Though strychnine is useful in restoring temporary health, it does not prevent the possibility of further relapse. J. Bradford McConnell (Quarterly Jour. of Inebriety, Jan., '94).
>
> Strychnine used, $^1/_{48}$ grain hypodermically, gradually increasing the dose till physiological effects declared themselves, the highest dose thus injected being $^1/_{16}$ grain. At the same time $^1/_{64}$ grain of strychnine nitrate is given by the stomach every two hours, together with from $^1/_{250}$ to $^1/_{500}$ grain of atropine sulphate in gentian infusion. J. H. Ward (Med. World, Dec., '93).

I have nothing to say in favor of the hypodermic injection of potent drugs in these cases, except in states of unconsciousness, and, very rarely, to procure sleep if other hypnotics have failed. I prefer administration by the mouth.

Strychnine with atropine hypodermically carefully used for the drink-craving, and afterward strychnine alone, with nearly the same results in both experiments: over one-half of the cases treated had already relapsed. R. M. Phelps (Northwestern Lancet, Oct. 10, '93).

Several cases in which nitrate of strychnine, in doses of from $^1/_{30}$ to $^1/_6$ grain, twice daily, was administered for ten days, then once daily for ten days, with temporary benefit. In many of the cases there was a relapse, sooner or later, showing the need for prolonged seclusion, with the operation of moral and hygienic conditions. J. Bradford McConnell (N. Y. Med. Jour., June 3, '93).

Seven cases of acute and chronic alcoholism treated by means of subcutaneous injections of nitrate of strychnine, in $^1/_{20}$ to $^1/_{10}$ grain doses, daily or oftener, as indicated by the gravity of the case. The desire for drink disappeared on the third day, being succeeded by a dislike for liquor, the moral conditions appearing to be entirely changed. W. B. Breed (Med. News, Apr. 7, '94).

Strychnia recommended. C. C. Hubbard (Charlotte Med. Jour., Mar., '94); Gamper (Lancet, Apr. 18, '91).

Hypodermic injections of strychnine do not ward off subsequent attacks. R. W. Branthwaite (Brit. Med. Jour., May 14, '92).

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In the alcohol wards of the Bellevue Hospital the use of strychnine and the solanaceæ, with certain adjuvant tonics and moral influences, is employed in cases of periodic alcoholism. The drugs selected are those which the experience of ten years in the care of these cases has shown to be most useful. Selected patients, after having passed through an attack of acute alcoholism, and are convalescent, are allowed to remain two days. Only persons who have reasonable intelligence and who show real evidence of sincerity are chosen. The following solutions are used:—

℞ Strychnine nitrate, $^1/_{15}$ grain.
Atropine sulphate, $^1/_{300}$ grain.
Distilled water, 10 minims.

M. Sig.: Inject t. i. d.
First day injection.

℞ Strychnine nitrate, $^1/_{20}$ grain.
Atropine sulphate, $^1/_{200}$ grain.
Water, 10 ounces.

M. Sig.: Inject t. i. d.
Second day injection. C. L. Dana (Post-Graduate, July, '96).

Once insomnia has disappeared, the propitious moment for the use of strychnine has arrived. The period of depression will be more or less prolonged; the malnutrition, already great during the acute attack, will increase; all the functions will droop unless a stimulant is found to increase the vital forces, and, usually, alcohol is the stimulant instinctively sought for by the victim, who thus treads in a vicious circle. To avoid this a stimulant other than alcohol must be selected for the patient, and not by him,—a medicine, and not a sort of food. The most appropriate for this purpose is strychnine, as it meets all the requirements rendering its employment necessary. Combemale (Le Bull. Méd., Apr. 12, '96).

Strychnine is the most valuable single drug in the treatment of chronic alcoholism; it is possible by its use alone in most cases to abolish the desire for drinking. J. M. French (Amer. Med. Compend, Oct., '97).

The principal indication for the strychnine treatment is found in cases of confirmed alcoholism without acute attacks. But, in fatty degeneration of the organs, the strychnine treatment does not and cannot produce any modification of the symptoms. It even constitutes a danger. Strychnine is slowly eliminated by the urine, the saliva, and the bile, even when the organs are intact and prevent accumulation. Hence, cirrhosis of the liver and renal impermeability are two more great contra-indications to the employment of this drug. Case of an alcoholic, who suffered from cirrhosis of the liver with ascites, in whom tetanic symptoms occurred after the fifth injection. Mer-

cier (Gaz. Heb. de Méd. et de Chir., May 16, '97).

Indication for the use of strychnine is the period of alcoholism without acute attacks. If there is an acute attack imminent, opium will prevent it, and strychnine then becomes useful in warding off another and in conducing to a complete cure. There are, however, instances when the drug cannot be used without adding an acute to the chronic poisoning. If there is marked fatty degeneration, a premature senescence of the tissues, failure of mental functions, an arcus senilis, or cardiac degeneration, the tissues cannot be regenerated by this drug. F. Combemale (Gaz. Heb. de Méd. et de Chir., p. 457, No. 39, '97).

Strychnia is a valuable drug both as a tonic and a stimulant, but should not be given alone except immediately after the withdrawal of the spirits. T. D. Crothers (Penna. Med. Jour., Apr., '98).

Having found liquor ammoniæ acetatis in acute alcoholism, and strychnine (both by the mouth) in subacute and chronic alcoholism, quite as effectual as the subcutaneous administration, I eschew the latter method. The simpler and safer the remedies used, the more permanent and helpful will be the treatment to the sufferers.

Hypnotism has been lauded as a curative agent, but I cannot recommend it, having seen many cases in which it has failed and some in which it has left mental injury. Still less can I advise recourse to alleged remedies, or remedial processes, the composition or particulars of which are kept secret. I have seen substantial mischief after the use of various "cures" of this description.

Most gratifying results from the systematic use of hypnotism in the author's institution for dipsomaniacs. Arthur Tooth (Lancet, Aug. 24, '89).

Most marvelous results from hypnotism in cases of alcoholism, without any symptoms of collapse, or other evil effects from the withdrawal of the stimulant. V. Corval (Ther. Monat., Sept., '89).

Cases successfully treated by hypnotism. R. W. Felkin (Provincial Med. Jour., Mar., '93); Hamilton Osgood (Boston Med. and Surg. Jour., May 1, 8, '90); Benno and Steinmetz (Weekly Med. Review, Mar. 1, '90); Forel (Münch. med. Woch., Sept. 17, '90); Tuckey (Brit. Med. Jour., Aug. 27, '92)

Several cases seen after hypnotism had been tried and failed. Inebriety is a disease of the brain which has gone so far as to affect the will-power. Till the injured brain-tissue is rebuilt there can be no permanent cure. Stewart (Brit. Med. Jour., Aug. 27, '92).

Hypnotic suggestion successfully employed in twenty-three cases. Bushnell (Times and Register, Sept. 14, '95).

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As an aid in the treatment of inebriety, autosuggestion plays a subordinate part; nevertheless, it also has its experimental uses. Let the patient, already anxious for recovery, be impressed with the idea that his recovery will be much influenced by his own mental attitude:. that if it is positive and hopeful he will recover his health much more easily and rapidly than if it is despondent or indifferent, and that in this matter he can greatly assist himself. This being impressed, teach him, with earnestness and sincerity, to affirm to himself constantly, and especially while going to sleep, ideas like the following, expressed in such language as the physician thinks advisable: "The power of the alcohol habit (or drug habit) is broken; I am sufficiently strong, and my will is sufficiently firm to resist successfully every temptation; no influence can make my hand carry the poison to my lips. I shall gain strength and self-control through sleep; I shall rapidly and perfectly recover." R. Osgood Mason (Quarterly Jour. of Inebriety, July, '97).

"Gold-cures," whenever analyzed, contain no gold whatever. Gold is non-assimilable, and inebriety is not reached by drugs alone or by special, concealed plans of treatment. In many cases of inebriety which have been cured in gold-

cure asylums, there is concealed periodicity. There are no facts to show that gold has any value in the treatment of this disease. Crothers (Jour. Amer. Med. Assoc., Oct. 8, '98).

To Produce Distaste for Liquors.— Time, patience, control, and study of individual peculiarities are required. Strychnine, sometimes atropine, judiciously employed, are at times useful; but there is no specific.

Small doses of atropine, less than $^1/_{100}$ grain, hypodermically, three or four times a day, produce distaste in from one to five days. Carter (Med. News, Mar., '95).

Same effect produced by ipecac, 20 minims of the fluid extract used as an hypnotic. Waugh (Med. Age, June 25, '95).

To overcome longing for drink, due to irritation of gastric nerve-supply:—

℞ Chlorinated water, 2 drachms.
Decoction of athæa, 5 ounces.
Cane-sugar, 2 drachms.

M. Sig.: A tablespoonful every two or three hours. Zdekauer (La Méd. Mod., Jan. 12, '95).

Disgusting an inebriate of alcoholic intoxicants is not to cure the disease of inebriety, or narcomania.

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The administration of drugs, like apomorphine, with the idea of causing a disgust for liquors, is dangerous and rarely satisfactory. The key-note to the successful treatment of these cases is to be found in sharp elimination. Where the bromides are indicated, they should be given in large doses,—from 50 to 100 grains; these doses should not be continued for more than a few days. No one remedy is capable of meeting a wider range of conditions than the Turkish bath associated with massage. T. D. Crothers (Quarterly Jour. of Inebriety, Oct., '96).

Excessive irritation following the removal of alcohol is often very quickly removed by the bromides. They should be given in large doses of at least 2 drachms every four hours in large quantities of water flavored with peppermint or tincture of cinchonia. As soon as the bromidial effects are noticeable, small doses of bitartrate of potassa and sulphate of magnesia should be given, with warm shower-baths, twice a day. Brominism is usually very slight after this, and only the slight sedative effects remain. Bromide of sodium seems to be the most powerful and prompt in its action. In vigorous plethoric inebriates, with a high degree of mental irritation and delirium, the sudden withdrawal of spirits and the substitution of bromide of sodium, 100-grain doses every three or four hours, is followed by rapid recovery.

Many cases cannot bear the bromides: they seem to intensify the debility and depression from spirits. Chloral should never be combined with bromides for its sedative effect, especially in inebriates. When the temperature falls and the heart becomes feeble, all bromides should be stopped. When low muttering delirium comes on, with muscular enfeeblement, the bromides are dangerous. Its indiscriminate use for all cases is unsafe, and its action should be watched carefully. Editorial (Quart. Jour. of Inebriety, Apr., '98).

Fresh fruits (oranges, etc.), an emetic, or a cup of hot tea, coffee, or cocoa are frequently sufficient to counteract the drink crave or impulse.

For *insomnia*, hyoscine hydrobromate, $^1/_{200}$ to $^1/_{100}$ grain, cautiously given, or a hot, wet pack is useful.

Hyoscine hydrobromate is the surest sedative with which to combat the cerebral excitement. Bruce (Gaz. degli Osp., Nos. 18-21, '90).

Excellent results obtained from hyoscine hydrobromate in the treatment of the insomnia of acute delirium and of alcoholism. Wetherell (Gaz. degli Osp., Nos. 18-21, '90).

The use of hyoscine hydrobromate is to be recommended, but its abuse will do more harm than good. The dose is from $^1/_{300}$ to $^1/_{100}$ grain, increased cautiously to $^1/_{50}$ grain. Lionel Weatherley (Jour. of Mental Science, July, '91).

Ipecac, 10 to 30 minims of the fluid extract. Dorsal decubitus to avoid nausea. Waugh (Med. Age, June 25, '95).

Chloralose has also been recommended as an hypnotic in these cases, its soothing effect continuing even after its influence as a soporific has been exercised.

Chloralose in 10-grain doses very effective as hypnotic. Haskovec (Wiener med. Woch., Apr. 7, '95).

Chloralose in doses of from 1¾ to 15½ grains, preferably given in solution in boiling water. Sedative effect in from fifteen to twenty minutes after taking the drug. Haskovec (Revue Neurologique, Oct., '94).

In *heart-failure* the preparations of ammonia, especially the aromatic spirits, are effective.

In the heart-failure of chronic inebriates rest in bed and digitaline granules, one of $^1/_{240}$ grain being usually sufficient. Graham Steele (Med. Chronicle, Apr., '93).

Nitroglycerin is recommended against the vomiting of alcoholism. R. Humphreys (Brit. Med. Jour., Apr. 1, '93).

The influence of surroundings should not be disregarded. The patient should be separated from those of his associates who cater to his weakness, and made to enjoy, if possible, the company of those who, on the contrary, tend to counteract his habits.

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1. The patient should be instructed in regard to deceptive and injurious influences of alcoholic drinks, so that he is actually convinced that their use is, on all occasions, unnecessary. 2. The patient should be placed under good physical and social surroundings. For impaired digestion, irritable nervous system, and disturbed sleep, $^1/_{60}$ grain of digitaline with $^1/_{30}$ grain of strychnine at each meal, with from 20 to 30 minims of diluted hydrobromic acid at bed-time, will give excellent results. For constipation, 30 minims of fluid extract of rhamnus purshiana may be added to the acid. Instead of the digitalis and strychnine, a pill or capsule of a grain of extract of hyoscyamus, with 3 grains of cerium oxalate, may be given. Before an anticipated period of dissipation a pill of 2 grains of quinine sulphate, the same amount of extract of eucalyptus globulus, and $^1/_3$ grain of extract of cannabis Indica should be given with each meal for two weeks. 3. The patient should be separated from his associates, and, if this cannot be done in any other way, he should reside in a well-regulated asylum for six to twelve months. N. S. Davis (Quarterly Jour. of Inebriety, Apr., '97).

Prophylaxis. — Successful prophylactic measures must include power to compulsorily seclude chronic alcoholics who are too will-paralyzed to apply for curative seclusion voluntarily; the teaching of the young in the poisoning influence of alcohol; the protection of infants against contamination from alcoholic nurses; the abstinence propaganda, especially among the rising generations; and suppression of the liquor traffic, either by a vote of localities or by general national prohibition.

In the evolution of inebriety insanitary conditions are influential, very marked results in some cases following removal to better sanitation. Crothers (Jour. Amer. Med. Assoc., Aug. 25, '94).

In 1892 St. Saviour's Sanatorium was empowered ("Laws of New York State," 1892, cap. 467) to receive, as voluntary and involuntary patients, female inebriates. In the latter case, any county or district judge or justice of a court of record, within the district where the inebriate resides, may, on production of an agreement to receive her and a certificate on oath by two physicians permanently resident in the State and in actual practice for three years, of date within twenty days prior to the application, commit for a year, with power to renew the term. Editorial (N. Y. Med. Jour., July 23, '92).

In Switzerland, in the Canton of St. Gall, by a law passed in 1891, anyone

rendering himself obnoxious or dangerous to his family or to the community, through drinking, may, with a medical certificate, be sent to an inebriate asylum, and be paid for out of the public poor-funds, if his friends are unable to defray the expense. Editorial (Quarterly Jour. of Inebriety, Oct., '92).

Severe punishment should be inflicted upon persons who encourage alcohol-addicted individuals to drink. Burr (Med. and Surg. Reporter, May 11, '95).

Strict State control of the sale of intoxicating beverages. Prices to be made too high for consumer or too low for dealers' interests, while tea, coffee, etc., dealers be exempted from price restrictions. Meilhon (Annales Médico-psychologiques, Mar., Apr., '95).

Reduction of number of taverns; reduction of tax on cider and beer; moderate tax on wine; notable increase of taxation on alcohol; forbiddance of manufacture of drinks containing essential oils. Lancereaux (La France Méd. et Paris Méd., Mar. 8, '95).

The disorders to which infants are exposed when nursed by women who partake too freely of stimulants—infant nervous attacks, convulsions, etc.—are frequently attributed to other causes. (Vallin.)

The majority of the posterity of drunkards and of persons of an ill-balanced nervous system should abstain altogether from alcohol, or, at least, before partaking of it, consult a competent physician. Sir Dyce Duckworth (Lancet, Aug. 26, '93).

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Cases of alcoholism in children showing importance of not prescribing alcohol. Goriatchkine (Wratsch, No. 15, '96).

Medico-legal Considerations.—Though there is some difference in the medico-legal treatment of alcoholism in different countries, there is a general agreement as to the form of civil law in the premises.

Insurance.—The concealment by proposers and their referees of the intoxication of the assuring may render a policy void. There are probably at least 600,000 reformed drunkards in the world. Some offices reject such lives, others accept them. The writer believes that they are mostly insurable, after a certain term of years of abstinence, with a weighting of the premium. It is sometimes difficult to settle whether a person has died from accident or from acute or chronic alcohol poisoning. Insurance companies lose largely by the alcoholism of the insured. (Crothers, Mattison, Fox, Kerr.)

Report of British Medical Association on the mortality from alcoholism, based on an examination of 4222 cases. It also contains returns as to the alcoholic habits of the inhabitants of Great Britain, and as to the relative alcoholic habits of different occupations and classes. The following conclusions reached:—

"1. Habitual indulgence in alcoholic liquors beyond the most moderate amounts has a distinct tendency to shorten life, the average shortening being roughly proportional to the degree of indulgence.

"2. Men who have passed the age of 25, the strictly temperate, on an average, live at least ten years longer than those who become decidedly intemperate. (We have not, in these returns, the means of coming to any conclusion as to the relative duration of life of total abstainers and habitually temperate drinkers of alcoholic liquors.)

"3. In the production of cirrhosis and gout alcoholic excess plays the very marked part which it has long been recognized as doing; and that there is no other disease anything like so distinctly traceable to the effects of alcoholic liquors.

"4. Apart from cirrhosis and gout, the effect of alcoholic liquors is rather to predispose the body toward attacks of disease generally than to induce any special pathological lesion.

"5. In the etiology of chronic renal disease alcoholic excess, or the gout which it induces, probably plays a special part.

"6. There is no ground for the belief that alcoholic excess leads in any special manner to the development of malignant disease, and some reason to think that it may delay its production.

"7. In the young alcoholic liquors seem rather to check than to induce the formation of tubercle, while in the old there is some reason to believe that the effects are reversed.

"8. The tendency to apoplexy is not in any special manner induced by alcohol.

"9. The tendency to bronchitis, unless, perhaps, in the young, is not affected in any special manner by alcoholic excess.

"10. The mortality from pneumonia, and probably that from typhoid fever also, is not especially affected by alcoholic habits.

"11. Prostatic enlargement and the tendency to cystitis are not especially induced by alcoholic excess.

"12. Total abstinence and habitual temperance augment considerably the chance of death from old age or natural decay, without special pathological lesion." Isamberd Owen (British Med. Jour., June 23, '89).

Evidence.—Evidence of an intoxicated witness is not receivable.

Confession of an intoxicated person is valid, if no inducement has been held out (England).

Contracts executed while intoxicated are voidable.

Wills made while intoxicated have been voided. Intoxication and incapacity, it was held, must be complete, till 1892 (Tyler *v.* Maxwell, Court of Session, Edinburgh, Nov. 1, 1892), when Lord Wellwood ruled that the defensive plea of intoxication having to be total, though true in a sense, did not mean total disablement by drink. And (Morgan and another *v.* Kitchen, Probate and Divorce, High Court, London, 1891), though a first will was held good, one executed a year later was pronounced bad, on the ground that the testator had (though not intoxicated when he made the second disposition) become, after the earlier date, mentally incapacitated after frequent (not intoxication but) "taking his drops," and after delirium tremens. Attestation is invalid if done by an intoxicated attestator, but presumption is in favor of validity.

Criminal Jurisprudence. — Under Greek law crime committed in intoxication was liable to double punishment. Roman law remitted capital punishment to intoxicated soldiers. Mohammedan law does not admit a plea of intoxication. New York Penal Code holds no act less criminal by having been committed while intoxicated, but intoxication considered to determine purpose, motive, and intent. Voluntary intoxication is not a defence in homicide without provocation. Delirium tremens, as a disease secondary to voluntary intoxication, has been accepted in many trials in England and the United States as a valid plea for irresponsibility (Justice Stephen, Newcastle, 1881; Justice Hawkins, Shrewsbury, 1895), though this ruling has not been followed by some other judges. In other trials the accused has been acquitted as having been unable, from intoxication, to have been capable of any intent, or as having been the subject of a well-fined mental disease, as having (through inherited or acquired mental weakness) been unable to drink intoxicants without insane sequelæ like the average man. English law also takes drunkenness into account (Lord James) "if it produces a sudden outbreak of passion causing the commission of crime under circumstances which, in a sober person, would reduce a charge of murder to manslaughter."

Altogether, there has generally been a growing tendency of judges and juries to take alcoholism (with mental disturbance) into account, during the past thirty years. German and Swiss law prescribes a difference in the punishment of offences committed in culpable and inculpable intoxication.

Minor Offences.—In theft and other minor offences, in England, committed in alcoholism, intoxication and delirium tremens have been accepted as an answer in some cases, while many such offenders have been liberated, to come up on their own recognizances with a limited time if called on, on the understanding that they would forthwith go to a Home for Inebriates.

The affirmation of irresponsibility should involve prolonged commitment to an insane-asylum. Motet and Vidal (Quarterly Jour. of Inebriety, Jan., '93).

Inebriety is a disease of the brain, a form of insanity wholly dominating the volition, and beyond the power of the victim to control. Clark Bell (Medico-Legal Jour., Dec., '92).

The knowledge of right and wrong may exist without the power of discriminating between the two. T. L. Wright (Quarterly Jour. of Inebriety, Jan., '93).

Criminal acts come from inability to understand the relation of surroundings, and to adjust the conduct to the varying conditions of life. The criminal acts of the inebriate spring from this confusion of senses and judgment. This shows the irresponsibility of inebriates. T. D. Crothers (Quarterly Jour. of Inebriety, Jan., '93).

At meetings of creditors, by the author's advice, legal advisers have refrained from calling as witnesses persons whose brains had been so affected by intoxicants as to dim the perception of truth and render their evidence valueless. Norman Kerr ("Inebriety," third edition).

By existing British law, habitual drunkenness, as such, forms no defense, either in civil or criminal cases, except in so far as it may be admissible as evidence with a view to prove facts which can be construed as establishing legal incapacity or insanity. J. R. Mellraith (Proceedings of the Soc. for the Study of Inebriety, Aug., '93).

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Statistics based on 1500 cases (1200 men and 300 women) of alcoholic insanity having required entrance into an asylum shows that more than two-fifths of delirious alcoholic patients had committed crimes or misdemeanors. Of these acts the most frequent are those directed against the life, and especially attempts of suicide. Serré (Paris Thesis, '96).

In some of the more recent trials certain diseased inebriate mental states, short of what is generally regarded legally as insanity, have granted exemption from responsibility. This recognition of such abnormal mind conditions as a legal answer has, however, had to be entered as a plea of insanity and not inebriety. It is greatly to be desired, in the interests alike of equity and justice, that certain abnormal, inebriate, disordered mental states should be accepted as a valid plea altogether from the standpoint of insanity. The alternative would be the classification of such pathological states of mind as a variety of mental unsoundness, as in Belgian law. The former method of a distinct, independent, legal recognition is, however, preferable, if for no other reason than that the inebriate should not be associated in treatment with the insane.

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On the first of January, 1900, all the German States will have a common civil law. The sixth paragraph of the new Code runs thus: The Interdicted can be:

1. He or she who, in consequence of mental insanity or mental weakness, cannot provide for his or her affairs.

2. He or she who brings himself or his family into the danger of need by prodigality.

3. He or she who, in consequence of inebriety, cannot provide for his affairs, or brings himself or his family into the danger of need or endangers the safety of others.

The interdiction is to be revoked as soon as the reason for interdiction ceases to exist. William Bode (Proceed. of the Soc. for the Study of Inebriety, Nov., '97).

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ALEXIA. See APHASIA.

ALKALOIDS.—The alkaloids are organic basic substances, the active principles of most poisonous plants. They are termed "alkaloid" owing to their behavior with acids, which simulates that of alkaline substances,—ammonia, etc. Combining with acids they form salts which are convenient, owing to the smallness of their doses and their comparative precision as to the effects to be produced.

Dose and Properties.—A point of importance in prescribing alkaloids, when they are administered in tablet form, is to avoid too rapid drying of the tablets, the preparation otherwise becoming deteriorated.

Case showing that certain alkaloids are so delicate that they are injured if the tablets are dried too quickly. A prescription of his, calling for a tablet of hyoscine, morphine, and atropine, was dried in a half-hour instead of a day and a half, as recommended to him by druggists. J. A. Cutter (Medical Bulletin, June, '90).

The following alkaloids are official in the United States Pharmacopœia, but many others are employed that will be considered under their appropriate headings:—

Apomorphine hydrochlorate, dose, $^1/_{16}$ to $^1/_4$ grain.

Atropine, dose, $^1/_{200}$ to $^1/_{60}$ grain.

Atropine sulphate, dose, $^1/_{200}$ to $^1/_{60}$ grain.

Caffeine, dose, 2 to 10 grains.

Caffeine citrate, dose, 2 to 5 grains.

Caffeine effervescent citrate, dose, 1 to 3 drachms.

Chinoidine, dose, 3 to 30 grains.

Cinchonidine sulphate, dose, 5 to 40 grains.

Cinchonine, dose, 5 to 30 grains.

Cinchonine sulphate, dose, 5 to 30 grains.

Cocaine hydrochlorate, dose, $^1/_2$ to 2 grains.

Codeine, dose, $^1/_6$ to 2 grains.

Hydrastine hydrochlorate, dose, $^1/_4$ grain.

Hyoscine hydrobromate, dose, $^1/_{150}$ to $^1/_{100}$ grain.

Hyoscyamine hydrobromate, dose, $^1/_{64}$ to $^1/_{32}$ grain.

Hyoscyamine sulphate, dose, $^1/_{60}$ to $^1/_{32}$ grain.

Morphine, dose, $^1/_{10}$ to $^1/_2$ grain.

Morphine acetate, dose, $^1/_6$ to $^1/_2$ grain.

Morphine hydrochlorate, dose, $^1/_6$ to $^1/_2$ grain.

Morphine sulphate, dose, $^1/_6$ to $^1/_2$ grain.

Physostigmine salicylate, dose, $^1/_{64}$ to $^1/_{20}$ grain.

Physostigmine sulphate, dose, $^1/_{100}$ to $^1/_{60}$ grain.

Pilocarpine hydrochlorate, dose, $^1/_{12}$ to $^1/_3$ grain.

Piperine, dose, $^1/_2$ to 10 grains.

Quinidine sulphate, dose, 5 to 30 grains.

Quinine, dose, 1 grain to 1 drachm.

Quinine bisulphate, dose, 1 to 15 grains.

Quinine hydrobromate, dose, 1 to 20 grains.

Quinine hydrochlorate, dose, 1 to 15 grains.

Quinine sulphate, dose, 1 grain to 1 drachm.

Quinine valerianate, dose, 1 to 20 grains.

Sparteine sulphate, dose, $^1/_8$ to 1 grain.

Strychnine, dose, $^1/_{60}$ to $^1/_{20}$ grain.

Strychnine sulphate, dose, $^1/_{60}$ to $^1/_{20}$ grain.

Veratrine, dose, $^1/_{60}$ to $^1/_{30}$ grain.

Physiological Action.—Alkaloids have various degrees of physiological activity when introduced into the animal body. Many are slow in their action, and a large dose is required to produce any observable effect, while others act more rapidly, and are so potent that even a minute dose may destroy life. Compare, for example, narcotine, one of the alkaloids of opium, with nicotine, the alkaloid of tobacco. Twenty to 30 grains of the former have been taken by the human subject without producing any marked symptoms, while the twentieth part of a grain of the latter may induce symptoms so severe as to threaten death. It is also well-known that alkaloids may have a different kind of action on different animals. Thus, $\frac{1}{4}$ grain of atropine will produce serious symptoms of a complex character in a dog, while 3 or even 4 grains may be given to a rabbit without causing any more marked effect than dilatation of the pupil. In considering the physiological actions of those substances, the following generalization may, in the present state of science, be made tentatively: 1. As a general rule, the more complex the organic molecule, and the greater the sum of its atomic weight, the more intense will be the action of the substance. 2. Substances that split up quickly into simpler bodies produce rapid, but transient, physiological effects, whereas substances which resist decomposition in the blood or tissues may produce no appreciable results for a time, but, when they do begin to break up, the effects are sudden and violent, and usually last for a considerable time. 3. Alkaloids have frequently a double action on different parts of a great physiological system; and their action in a particular group of animals will depend on the relative degree of development of the parts of the system in that group. Thus most of the alkaloids of opium have such a double action: a convulsive action resembling that of strychnine, due to their influence on the spinal cord or on the motor centres in the brain; and a narcotic, or soporific, action resembling that of anæsthetics, due to their influence on sensory centres in the brain. Hence, in animals, where the spinal system predominates, as in frogs, these alkaloids act as convulsants; while in the higher mammals their principal action is apparently on the encephalic centres, which have now become largely developed. (J. G. McKendrick.)

Besides the individual physiological properties of alkaloids (these will be described under their respective headings), a few possess a property in common: that of reducing temperature when applied to the surface. This question was studied by Guinard and Geley, of Lyons. Of eighteen substances tried by the authors in solution or as ointments applied on the inner part of the thighs, four were found to possess a constant regulating effect upon thermic reaction. These were cocaine, solanine, sparteine, and helleborine. In cases of true hyperpyrexia a lowering of from 0.9° to 5.4° F. was produced, the average

fall being from 1.8° to 2.7° F., the effect varying according to the patient, and especially according to the disease. They produced a more marked change at the beginning and end of acute affections than in the middle of the attack, and in mild rather than in grave forms. In healthy subjects the effects were less apparent. It may be hoped to influence the temperature in this manner without administering the remedy internally.

Therapeutics.—As these agents are extensively administered hypodermically, it was at one time feared they might serve as vehicles for micro-organisms which in themselves might become pathogenic. In a series of experiments having for their object to answer these questions and to determine a method for the sterilization of such medicines Marinucci found (1) that, while all preparations studied contained microbes, all these microbes are not harmful. (2) That sterilization by heat does not alter solutions of strychnine, curare, bihydrochlorate of quinine, or borate of eserine. It enfeebles, but does not alter, the character of morphine and atropine. After sterilization, however, these drugs must be used in larger doses. The sulphate of eserine was found to be seriously altered, so that the solutions were, in a great measure, rendered inert. (3) That, to those solutions which are altered by heat, corrosive sublimate should be added in the proportion of 1 to 10,000. This seems to be efficacious, and in no way to injure the value of the alkaloid when given hypodermically.

Legal Medicine.—In medical jurisprudence alkaloids often come into play, the smallness of the dose of many of these salts serving the purpose of evil-doers or suicides. By well-known means their presence may be determined in the majority of cases; but still obscure in this connection is the influence of putrefactive processes—such as those which take place, after death, in the body—upon alkaloids which may have been administered during life. Ottolenghi recently conducted a number of experiments in order to ascertain the action of saprophytic micro-organisms on atropine and strychnine. He first tried the effect of adding a known quantity of atropine to some sterilized bouillon (1 to 10,000), which was afterward tested by dropping a couple of drops of it into a rabbit's eye. The usual effects of atropine ensued: the pupil dilated fully under the influence of the unaffected atropine. He then substituted for the sterilized bouillon separate cultures, in bouillon, of bacillus mesentericus, bacillus vulgatus, bacillus liquefaciens putridus, bacillus subtilis, and bacillus diffusus, which he had obtained from a human cadaver, the result being that the mydriatic effect of the atropine was entirely destroyed in four or five days by the action of the micro-organisms. A similar series of experiments were made with strychnine, the test for the alkaloid being that of injecting a certain quantity of the solution into a frog, the quantity being proportionate to the weight of the frog. It was found that for the first few days the toxic action of the strychnine, subjected to the influence of the bacteria, was distinctly increased; subsequently it was diminished. Some separate experiments made with cultures of bacillus coli and strychnine showed that, with this bacterium, the toxicity of the alkaloid materially diminished from the first. After an exposure of three months the alkaloid had lost one-half of its potency. (J. Dixon Mann.)

ALOES.—The preparations of aloes employed in the United States are ob-

tained from two varieties: the *Aloe Barbadensis,* or *Vera,* and the *Aloe Socotrina.* The former is the inspissated juice of the Barbadoes, or Curaçoa, aloes and occurs in orange-brown, opaque, resin-like masses that give off an odor of saffron, and are extremely bitter to the taste. The Socotrine aloes is the inspissated juice of the *Aloe Perryi.* It varies in color from a yellowish-brown to an opaque, reddish-brown and also occurs in resinous masses and emits the same saffron-like odor and is as bitter to the taste.

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1. Curaçoa aloes are as efficient as and, being much cheaper, should be preferred to Socotrine aloes; the greater portion of the latter as sold to-day is made up of the former. 2. The resin of aloes is an ether or organic salt, and varies according to the kind of aloes and the varying constituents of the acid, the alcoholic constituent being aloresinotannol, and being the same in both Barbadoes and Cape aloes, the only specimens thus far examined. 3. Aloin contains emodin, to which its laxative properties are probably due. 4. Many laxative drugs beside aloes—such as senna, cascara sagrada, rhubarb, buckthorn-bark—owe their laxative property to this substance, emodin, or some substance like it, derived from anthraquinone, and homologous or isomeric with it. A. R. L. Dohme (Amer. Jour. of Pharm., No. 8, '98).

Dose.—Both varieties of aloes may be given in doses of from 1 to 5 grains as a laxative, and 10 grains as a purgative. The purified aloes (*aloes purificata*) of the U. S. P. should invariably be prescribed, since the commercial aloes contains impurities. The other official preparations of aloes are the following:—

Aqueous extract of aloes. Dose, $^1/_2$ to 5 grains.

Pill of aloes containing 2 grains of the purified aloes.

Pill of aloes and asafœtida, containing $1^1/_3$ grains of each drug to the pill.

Pill of aloes and iron, containing purified aloes, sulphate of iron, and aromatic powder, 1 grain of each to the pill.

Pill of aloes and mastic (Lady Webster pill), containing 2 grains of purified aloes and $^1/_2$ grain each of mastic and red rose.

Pill of aloes and myrrh, containing 2 grains of purified aloes, 1 grain of myrrh, and $^1/_2$ grain of aromatic powder per pill.

Tincture of aloes and myrrh, containing 10 per cent. of purified aloes. Dose, 1 to 2 drachms.

Tincture of aloes, containing, also, 10 per cent. of purified aloes. Dose, 1 to 2 drachms.

Aloes acts slowly; it can, therefore, be given at bed-time and its effects be counted on for the next morning. It tends to cause griping; a carminative—belladonna or hyoscyamus—should, therefore, be simultaneously administered. The pill of aloes and myrrh of the U. S. P. is intended to avoid this untoward effect of aloes.

Applied to a wound in the form of powder aloes exercises its laxative action. It also acts upon a nursing infant when given to the mother.

Aloin.

Aloin is the active principle of aloes. The drug extracted from the Barbadoes aloes is identical with that taken from the species of Curaçoa and Natal. Aloin occurs in yellowish-white, acicular crystals, is soluble in hot water and alcohol, much less so in acetic ether, and sparingly soluble in chloroform, ether, and benzol.

Dose.—The dose of aloin is from $^1/_{10}$ grain to 2 grains.

Physiological Action.—The main effect of aloes is upon the large intestine, but it is likewise a cholagogue, actively

promoting the flow of bile. These effects, combined, cause increase of the peristaltic action of the bowel. Aloes causes engorgement of the hæmorrhoidal blood-vessels and thus tends to render hæmorrhoids painful at the time it is used, if any be present. The other pelvic organs —the uterus and appendages—are also congested. Hence, pregnant women should use aloes most carefully, if at all.

The active principle, aloin, acts as a powerful purgative when given by the mouth or subcutaneously. Natal aloin acts in cats and dogs only after very large quantities, but the effects are promptly produced when an alkali is added to the drug in order to decompose it. In man fed on meat exclusively aloin is very active, but not so in persons subjected to a mixed diet. Aloin in itself, therefore, has little or no purgative properties, and, in order to produce its characteristic effects, it must undergo decomposition in the intestines and a new and more active substance be formed. The slowness of its action is thus explained. (Meyer.)

Therapeutics.—It is, of course, in constipation that aloes is especially used. It is indicated when there is intestinal atony, but when its administration is prolonged it tends to aggravate the condition it is intended to counteract. Aloin possesses two advantages over aloes, —namely, smaller doses and comparatively slight tendency to induce irritation in normal doses. It is usually combined with extract of belladonna and nux vomica or strychnia in small doses. An active laxative pill is thus obtained, which tends to counteract constipation without overtaxing the normal functions of the intestine.

Chlorosis.—In chlorosis aloes is usually combined with iron: the pill of aloes and iron of the U. S. P. It is best, however, not to use this pill, owing to the constipating effect of the preparation of iron utilized in it. The pyrophosphate of iron or dialyzed iron is to be preferred.

Amenorrhœa.—When this condition is due to anæmia a pill of aloes and pyrophosphate of iron is of great value. In uncomplicated cases the pill of aloes and myrrh is to be preferred, the congestive influence of the active drug tending greatly to facilitate physiological menstruation.

Hæmorrhoids.—Aloes is said by some to be valuable in this disorder, especially when due to general relaxation of the vascular system, the hæmorrhoidal veins bearing the brunt of the latter.

ALOPECIA.—From Gr., $\alpha\lambda\omega\pi\eta\xi$, fox.

Definition.—Partial or general falling of the hair while the pathological process is in progress.

Varieties.—Alopecia may be physiological or be due to an acute or chronic general morbid state. It may be congenital or occur as a consequence of old age. Senile alopecia, when occurring in younger individuals, without apparent lesion, is recognized as premature alopecia.

Pathological alopecias, due to a general morbid condition, may be acute or chronic.

The acute form presents itself especially during the recovery from scarlet fever, scarlatinoid erythema, small-pox, typhoid fever, and child-birth. Certain forms of rapid alopecia are due to unknown causes of nervous origin.

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Neurotic alopecia is a rare affection. Two varieties are to be noted. The partial neurotic alopecia that occurs in the area of distribution of a nerve after an injury of that structure is occasionally

seen. General and complete alopecia from neurotic causes is even less common. In almost every case a severe nervous shock precedes the falling of the hair. Illustrated case. William S. Gottheil (Med. Record, Aug. 21, '97).

The chronic variety may be due either to want of care of the hair; bad cosmetics; heavy hats; poor general hygiene; lack of sleep; excesses; poor food; poor constitution; arthritism; struma; chronic poisoning (mercury); anæmia and chlorosis; diabetes; phthisis; cancer; syphilis; leprosy; in the two latter with or without visible lesions.

Alopecia may also be due to a local disease of the scalp, and occurring in that case as one of the secondary phenomena of the chief affection. The principal affections in which alopecia may thus occur are erysipelas, eczema, seborrhœic eczema, psoriasis, lichen, pityriasis rubra, pemphigus foliaceus, impetigo, acne (atrophic acne), sycosis, lupus erythematosus, and scleroderma.

In another class of affections alopecia occurs as the principal symptom,—namely, seborrhœa, pityriasis capillitii, etc.; folliculitis due to drugs; keratosis pilaris; alopecia areata; tricophytosis, and favus. (Brocq.)

There are also indefinite varieties: such as the form due to a constant scratching of the head,—the trichomania of Besnier.

Case in which the hair of the head and both eyebrows rubbed off on account of pruritus. George T. Elliot (Jour. Cut. and Genito-Urin. Dis., Sept., '95).

Case of traumatic alopecia following scratches. G. T. Jackson (Jour. Cut. and Genito-Urin. Dis., Sept., '95).

That occurring in weak and hydrocephalic children from constant pressure of the head of the bolster.

Alopecia of the vertex in women, due to combs and hair-pins, is also classed among the indefinite varieties.

A variety of alopecia which occurs rapidly, but only temporarily, is frequently observed in connection with menstrual disturbances in women.

Symptoms. — *Congenital Alopecia.* — This form of alopecia is uncommon; it may be local or general, temporary or permanent. Keratosis pilaris and moniliform aplasia may coincide with it. It may be due to lack of development of the hair-follicles, due to backwardness in the development of the hair; or to a pathological condition occurring during intra-uterine life, ichthyosis, xeroderma, or trophoneurosis. Congenital alopecia is frequently associated with slow and late dentition.

Senile Alopecia.—Senile alopecia may begin at 45 or 50 years. The hairs first become gray, then white, dry up, and their root atrophies. They finally fall, while the scalp shows the signs of senile cutaneous atrophy.

This form usually begins at the vertex, rarely at the temples.

Senile and precocious alopecia is usually severe and progressive. It is confined to the antero-superior portion of the scalp, beginning on the top of the cranium and moving forward, leaving a little tuft of hair above the forehead. The posterior and lateral portions of the scalp preserve their hair almost, or quite, intact. Fournier (La Méd. Mod., Dec. 11, '90).

Alopecia Following Acute and Chronic General Diseases.—Though usually not marked, alopecia in these cases may be intense and general. Seborrhœa is frequently present concomitantly. The alopecia is not especially localized; it affects uniformly the scalp, thinning out the hair.

The alopecia of convalescence progresses rapidly, being produced in the

course of a few weeks. It generally affects all parts of the scalp equally, and rarely results in complete baldness.

Cachectic alopecia occurs in the course of pulmonary phthisis, cancer, cirrhosis, malaria, scorbutus, diabetes, etc. It affects the entire scalp impartially. The remaining hairs are dry, lustreless, and brittle, often breaking off before falling out. Fournier (La Méd. Mod., '90).

Syphilitic Alopecia.—This variety of alopecia is usually found in irregular thinned out patches or streaks over almost all the scalp. The hairs are dry and their roots are atrophied; they fall out rapidly. Every degree may be observed, from simple thinning of the hair to general alopecia of the body. Some seborrhœa of the scalp is frequently present. The eyebrows are frequently thinned.

In some cases syphilitic alopecia is due to secondary or tertiary lesions of the scalp.

Syphilitic alopecia occurs in the third to the sixth month of the disease, or, rarely, in poorly treated cases, at the end of one or even two years. It comes early in the disease or not at all.

There are two forms of syphilitic alopecia: the symptomatic, accompanied either by pustulo-crustaceous, "acneiform" lesions, forming the little brownish or blackish crusts so common in the scalp from the third to the sixth month of syphilis, or, more rarely, by a very slight pityriasis-like eruption, sometimes only to be distinguished by a lens; the idiopathic, which is the most common, and which, in reality, is accompanied by a lesion. (Giovaninni and Darier.)

There is a proliferation in the hair-bulb, and the fallen hair is often found to be atrophied at its root. There is no itching, redness, nor other symptom occurring in connection with syphilitic alopecia, other than the mere falling of the hair. It is asymmetrical, affecting any locality by chance. Sometimes the fall of hair is diffused, resulting in a general thinning; at other times it occurs in patches; occasionally both forms occur together. Fournier (L'Union Méd., Dec. 4, '90).

Premature Idiopathic Alopecia.—This form of alopecia may begin early. The falling hairs are replaced by smaller hairs, which in their turn fall out, until finally only a smooth, shining scalp is left.

Frequently, besides the fringe of hair always left at the back of the head a small tuft of hair is left at the anterior portion of the scalp, just above the middle of the forehead. (Jackson.)

Two cases of alopecia universalis observed in male adults presenting the sequelæ of iridochoroiditis. In one case the ocular disease appeared subsequent to the loss of hair; in the other it preceded it by about a year. Froelich (Revue Méd. de la Suisse Rom., Dec., '90).

Report of an unusual case which began as a patch the size of a penny on the right parietal region, which, being treated, was again covered with hair. Around the former patch the hair began to thin; so that the patient eventually presented the unusual appearance of a tuft of natural hair where the alopecia originally existed, connected with a band of natural hair running from ear to ear, while all the rest of the hair was thinned. Rogers (Brit. Med. Jour., Apr. 28, '94).

Case of complete generalized alopecia combined with partial anæsthesia and analgesia in a man 20 years old. Bissett (Maritime Med. News, Feb., '94).

Etiology.—Alopecia following acute and chronic general diseases is due to lesions of the hair caused by the disease, aided by neglect of the hair during illness. It occurs most frequently after typhoid fever, the eruptive fevers, especially scarlatina, and, less frequently,

erysipelas. The severer phlegmonous diseases and typhus are followed by alopecia, as also occasionally severe accidents, hæmorrhages, and pregnancy. Many women lose their hair after a perfectly normal labor. (Fournier.)

[Fournier says nothing of the influence of nursing, but I am inclined to think this should be considered. It would be interesting to note if alopecia takes place when the woman does not nurse her infant, even when retaining perfect health. ARTHUR VAN HARLINGEN, Assoc. Ed., Annual, '92.]

All prolonged debilitating influences; excessive work, intellectual labor especially; genital excesses, overindulgence at the table, watching, and late hours may give rise to alopecia. Excessive intellectual work, however, is less likely to produce alopecia than the other forms of excess.

As regards premature idiopathic alopecia, women are less frequently affected than men. In many cases this form of alopecia seems to be hereditary.

Excessive mental work, excesses, and a bad hygiene of the scalp seem to be factors in its development. (Brocq.)

Pressure of the anterior temporal, posterior temporal, and occipital arteries by a stiff hat has been mentioned as a cause of this form of baldness. (F. A. King.)

The escape of the little tuft of hair above the forehead has been attributed to the fact that the supra-orbital arteries escape from pressure by their passage between the two frontal eminences. (Jackson.)

Gout or an arthritic diathesis is a cause of premature alopecia in patients and even in their progeny. Fournier (La Méd. Mod., Dec. 11, '90).

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The blood-supply to the scalp is conveyed by the frontal, temporal, and occipital arteries, situated just where a tight hat would press on them and bring about a gradual starvation of the hair-follicles. A woman, on the other hand, wears her hat resting lightly on top of the head, bringing no pressure whatever on the arteries, and thus escapes baldness. The maximum of hat-pressure in a man comes on the frontal arteries, and in consequence we find baldness generally commences on the regions supplied by those vessels. M. C. Black (Indian Lancet, Apr. 16, '98).

That frequent washing of the head encourages loss of hair is the opinion of the majority of dermatologists.

Pathology. — In alopecia following acute and chronic general diseases the hairs are no longer formed; their roots become atrophied, and they finally fall out. The alopecia of convalescence is due to disturbance of nutrition of the tissues.

Premature idiopathic alopecia is due to a fibrous transformation of the derma, which strangles in its meshes the elements found in the scalp, especially the hair-follicles. As to the pathogenesis, alopecia may be considered a specific microbic affection.

The specific microbacillus of fatty seborrhœa, when introduced into the pilosebaceous follicle, produces four constant results: (*a*) sebaceous hypersecretion; (*b*) sebaceous hypertrophy; (*c*) progressive papillary atrophy; (*d*) death of the hair. These phenomena result from seborrhœic infection upon smooth regions as well as upon the hairy ones. The vertex is the seat of election of this infection. Common baldness is only a chronic fatty seborrhœa of the vertex. Not only is follicular seborrhœic infection indispensable in the production of baldness, but this seborrhœic infection remains intense, pure, and permanent until the baldness is fully and permanently established. (Sabouraud.)

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Seborrhœa oleosa is an affection characterized by exaggeration in the flow of sebum, increase in the diameter of the orifices of the sebaceous glands, and a diffuse loss of hair. It occurs in paroxysms like the exudation, but eventually becoming permanent.

This affection is due to a microbacillus which had already been discovered, but not rightly interpreted by Unna. This microbacillus forms a mass in the upper third of the hair-follicle, between the surface of the skin and the point where the sebaceous gland opens into the follicle. This mass is the oily cylinder which may be extracted from the follicle by pressure on the skin. Secondary infections may be superadded to seborrhœa of the face, giving rise to acne or furunculosis. On the scalp it causes seborrhœic alopecia.

Ordinary alopecia areata is closely related to seborrhœa. Any patch of alopecia areata is the seat of an intense localized seborrhœic infection, both previous to the loss of hair and while the latter persist.

In chronic alopecia areata the infection of the hair-follicle is a permanent one; acute alopecia areata is a localized acute seborrhœa; alopecia decalvans is a general chronic seborrhœa. R. Sabouraud (Ann. de l'Inst. Past., Feb., '97).

These opinions of Sabouraud are not at present accepted by dermatologists generally.

Prognosis.—In senile alopecia the prognosis is unfavorable, the chances of cure being practically *nil.*

In alopecia following acute general diseases, on the contrary, the prognosis is generally good, and the hair soon recovers its former state, though in some cases seborrhœa persists and requires careful treatment to prevent relapse of the alopecia.

In serious chronic diseases, however, such as phthisis or cancer, the prognosis is unfavorable.

The alopecia of convalescence is temporary and reparable; entire repair of the loss occurring in your people; after forty years of age the hair is rarely reproduced in its integrity. Fournier (La Méd. Mod., Dec. 11, '90).

[By no means is this always the case in youth in my experience. A. Van Harlingen, Assoc. Ed., Annual, '92.]

Syphilitic alopecia, when not due to a local lesion, is only temporary and is soon recovered from by an appropriate specific and hygienic treatment. When due to a local lesion the alopecia may be incurable if the hair-follicle has been destroyed.

Syphilis never causes permanent and complete baldness. Properly treated it is accompanied by extensive alopecia in only one case in twenty. Fournier (L'Union Méd., Dec. 4, '90).

Premature idiopathic alopecia is usually looked upon as beyond treatment.

Treatment. — *Premature Idiopathic, Senile, and Congenital Alopecia.*—In these varieties general treatment is of importance. Arsenic and iron, continued for a long time and in small doses, alternately, should precede all the methods resorted to. (E. Besnier.)

A tonic treatment should be given where the nervous system seems to be at fault. The following pill should be taken thrice daily:—

℞ Strychnine sulphate, $^1/_{60}$ grain.
Reduced iron,
Quinine bisulphate, of each, 1 grain.
For one capsule.

When starvation of the nerves seems to be present, the compound syrup of the hypophosphites (Fellows's) is ordered in 1-drachm doses, thrice daily, with $^1/_{60}$ grain sulphate of strychnia in each dose. Doses of $^1/_8$ to $^1/_6$ grain of muriate of pilocarpine in a powder, daily, at bedtime, in water, are also of use. Ohmann-Dumesnil (New Orleans Med. and Surg. Jour., July, '92).

Mercuric bichloride or calomel internally, alternately with tincture of ignatia amara, 30 drops daily in three doses, or sulphurous acid, internally, are also recommended. (Shoemaker.)

Excesses of any nature should be refrained from, and any habit or occupation tending to depress the general vital process be counteracted.

> Alopecia should be treated not only by local applications, but by remedies which influence the entire system. Strong sulphur-baths of thirty to forty minutes, followed by massage for ten or twenty minutes and hot spray for three to five minutes, are useful. A half-pint of sulphur-water should be taken morning and evening, while iodine tincture and hot sulphur-water should be sprayed over the scalp. Ferras (Annales de Derm. et de Syph., vol. iv, No. 10, '94).

Resorcin is of great service in the treatment of alopecia. (Bulkley.)

Brocq recommends the following methods of using this remedy:—

℞ Resorcin, 1½ grains.
Hydrochlorate of quinine, 3 grains.
Pure vaselin, 1 ounce.

This is to be applied to that part of the scalp which is devoid of hair or from which the hair is rapidly falling. If the falling of the hair persists it is well to incorporate with it 5 to 15 minims of the tincture of cantharides, or to use the following:—

℞ Resorcin, 3 grains.
Hydrochlorate of quinine, 5 grains.
Precipitated sulphur, 30 grains.
Pure vaselin, 1 ounce.

Should these preparations produce much irritation of the scalp, an ointment composed of 20 grains of borax to 100 of vaselin should be applied. After the irritation is relieved, weaker preparations of resorcin and quinine can be employed, of which the following is an example:—

℞ Salicylic acid, 5 grains.
Resorcin, 3 grains.
Hydrochlorate of quinine, 5 grains.
Precipitated sulphur, 30 grains.
Pure vaselin, 1 ounce.

Should the falling of the hair be associated with seborrhœic eczema, a mercurial ointment, such as that of yellow oxide of mercury, varying in strength from 1 in 25 to 1 in 10, according to the severity of the trouble, should be used. This is only to be rubbed upon isolated patches at a time. After it has been employed and an alterative effect upon the skin produced, resorcin may again be resorted to:—

℞ Resorcin, 4 grains.
Salicylic acid, 7 grains.
Pure vaselin, 1 ounce.

When the scalp is excessively greasy the ointment previously employed and the natural oil of the skin should be removed by washing the scalp with a weak solution of ammonium acetate or by using Castile soap and warm water. Under no circumstances should the oily preparations be used continuously without occasional cleansing of the scalp. (Brocq.)

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> For seborrhœa of scalp with beginning alopecia following procedure should be carried out daily or once or twice weekly according to the severity of the case. 1. Wash scalp with tar-soap for ten minutes. 2. After rinsing, wash scalp with ½-per-cent. solution of corrosive sublimate in hot water. 3. Dry scalp, and rub into it a 5-per-cent. naphthol pomade, removing any excess of the same. Bayet (Med. News, May 21, '98).

The following lotion sometimes proves beneficial at the beginning of the affection:—

℞ Acetic acid, ½ ounce.
Pulverized borax, 1 drachm.
Glycerin, 3 drachms.
Alcohol at 60°, ½ ounce.
Rose-water, ½ pint.

Another procedure that proves occasionally effective is to rub the scalp lightly twice or thrice weekly, for three or five minutes, with a soft brush or sponge dipped in

℞ Sodium bicarbonate, 1 drachm.
Distilled water, 5 ounces.

A small amount of oil is to be put upon the hair the first or second day following each of the above applications. (Pincus.)

The head may be washed with the yelks of eggs, or white almond-oil soap or with tar-naphthol or ichthyol soap, according to the degree of tolerance of the scalp.

Any alcoholic preparation to which has been added a small amount of tincture of cantharides, tincture of nux vomica, acetic acid, salicylic acid, or citric acid, from ½ to 5 per cent., is recommended by Besnier and Doyon. It is applied with a piece of absorbent cotton after carefully drying the scalp.

The tinctura saponis viridis, often used to shampoo the scalp, is sometimes too strong. An ordinary soda-soap, made by dissolving about 1 ounce in 1 pint of water, and adding some soda or potassa may be used instead. When the scalp is cleansed, 1 part of benzol (from coal-tar), mixed with 10 parts of alcohol, is to be applied.

If this fails a 1- to 3-per-cent. alcoholic solution of naphthol, or the following formula may be used:—

℞ Resorcin, 5 parts.
Alcohol, 150 parts.
Castor-oil, 2 parts.

Other formulæ of value are

℞ Quinine sulphate, 1 part.
Alcohol, 60 parts.
Cologne-water, 1 part.

Or

℞ Tannic acid, 1 to 5 parts.
Alcohol, 2 parts (enough to make a solution).
Almond-oil, 40 parts.

Either of these may be applied locally, after carefully washing the scalp.

Tonics and faradizations are useful in that form of alopecia accompanied by hyperidrosis. Paschkis (Centralb. f. die Ges. Ther., Jan., '92).

Alopecia Following Acute and Chronic General Diseases.—Any general treatment appropriate to the primary disease naturally tends to improve the local process. A tonic treatment further assists the curative efforts.

After careful brushing out of the hair the head should be washed with a decoction of saponaria, or three yelks of eggs beaten up with one part of lime-water, or with warm water and good soap, and then carefully dried. This should be followed by the following lotion rubbed in daily:—

℞ Alcohol at 80°, 2½ ounces.
Camphorated alcohol,
Rum,
Tincture of cantharides,
Glycerin, of each, 75 minims.
Santal-wood essence,
Wintergreen-essence, of each, 5 minims.
Pilocarpine hydrochlorate, 7½ grains.

This is to be rubbed in lightly once daily.

Any exciting application containing rum or camphorated alcohol with spirit of rosemary—and to which may be added quinine, in the proportion of 4 to 30 of either tincture of nux vomica,

tincture of capsicum, or tincture of cantharides—may be employed.

If the hair be very dry some almond-oil or castor-oil may be applied from time to time.

It is well to keep the hair cut short until it begins to grow again.

Universal alopecia arrested in a case by thyroid extract, 5-grain tabloids three times a day. H. R. Beevor (Brit. Med. Jour., July 13, '95).

Thyroid treatment given a full trial in both universal and partial alopecia; unable to observe any beneficial effect therefrom. Hector Mackenzie (Brit. Med. Jour., July 20, '95).

Negative results from thyroid extract. H. Waldo (Lancet, Aug. 24, '95).

[I cannot too strongly warn the reader against placing too great confidence in the marvelous results obtained recently in numerous dermatoses from the thyroid treatment. The subject requires considerable control study before these results can be accepted. L. Brocq, Assoc. Ed., Annual, '96.]

Influence of thyroid extract upon hair-growth and general appearance in myxœdema. The same patient, a woman aged 66, as she appeared before treatment and as she appeared after taking two thyroid tabloids daily for fifteen months. (*T. F. Raven.*)

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The influence of thyroid extract shown in the case of a woman, aged 66 years, suffering from myxœdema, in whom the growth of hair during fifteen months was striking (see wood-cuts). Does not the remarkable influence of thyroid extract upon hair-growth suggest that the thyroid gland in its function is largely occupied with nutrition of the skin? Thos. F. Raven (Brit. Med. Jour., July 31, '97).

Syphilitic Alopecia.—The best treatment consists in early and thorough antisyphilitic measures. Local treatment is not really necessary, but, if applied, should consist in lotions containing mercuric perchloride, 1 to 500 or 1 to 1000, or ointments containing either yellow oxide or sulphate of mercury. (Brocq.)

The following treatment is recommended by E. Besnier:—

1. Cut the hair short.
2. Wash the scalp with soap and warm water every morning.
3. Apply the following ointment:—

℞ Salicylic acid, 75 grains.
Precipitated sulphur, 2½ drachms.
Lanolin,
Vaselin, of each, 1 ounce and 6 drachms.

Every evening rub in with a soft brush the following lotion:—

℞ Spirit of rosemary, 3½ ounces.
Cantharides tincture, 2½ drachms,
or salicylic acid, 15 grains.

Syphilitic alopecia is easily curable by the internal use of mercury. Local applications are useless. Fournier (L'Union Méd., Dec. 4, '90).

[Here I must differ from Fournier; local applications are valuable adjuvants. A. Van Harlingen, Assoc. Ed., Annual, '92.]

Although syphilitic alopecia almost always disappears spontaneously or under influence of general treatment, it is well to increase the activity of the new growth by frictions every other day with

℞ Perchloride of mercury 7 ½ grains.
Cologne-water, 8 fluidounces.

and to supplement this twice a week by

℞ Yellow oxide of mercury, 15 grains.
Pure vaselin, 6½ drachms.

Brocq (Jour. Cut. and Genito-Urin. Dis., Sept., '95).

George H. Rohé,
Baltimore.

ALOPECIA AREATA.

Definition.—A disease of the hair characterized by the rapid development of more or less circular or oval bald patches on the scalp and sometimes in other parts of the body.

Symptoms.—Alopecia areata usually presents itself in the form of rounded or oval patches, situated on the scalp or other hairy regions of the body. The skin of these patches is white and smooth, and in some cases discolored and somewhat depressed. At times the affection extends over the entire cutaneous surface.

The hairs become dry and colorless, their roots are atrophied, and they rapidly fall out.

Three main forms of alopecia areata have been recognized: alopecia areata achromatica (Bazin), in which the bald patches are discolored and excavated, as described above; false alopecia areata, in which the patches of baldness are more or less covered with thin, brittle hairs, which can easily be pulled out along with their roots,—a form of ringworm. The third variety is alopecia areata decalvans, in which the entire scalp, or the skin of other parts of the body, becomes bald in a few days, the hair falling with great rapidity.

In alopecia areata the hairs are dry, lustreless, thin, and brittle. Their roots are either atrophied and thread-like or swollen into irregular nodules. The medulla has disappeared, and air-bubbles may be seen in their interior. They frequently break close to the scalp, their free extremity being brush-like in appearance.

In the so-called false alopecia areata the few hairs left retain their hue and consistency.

Deductions based on a study of 257 cases:—

Four classes of cases are included under the generic name alopecia areata:

1. Universal alopecia; it is very rare.

2. Baldness occurring in one or more patches at the site of an injury or in the course of a recognizable nerve. This is comparatively infrequent.

3. A form first described by Neumann as "alopecia circumscripta seu orbicularis." The patches are small, from lentil- to pea- size, much depressed below the surface, with often a marked decrease of the sensibility. The prognosis is unfavorable.

The first three classes form less than 10 per cent. of all the cases classed as alopecia areata. They are undoubtedly of trophoneurotic origin.

4. The largest, numerically, is due to a vegetable parasite. Crocker (Lancet, Feb. 28, Mar. 7, '91).

Diagnosis.—Alopecia areata should be distinguished from *syphilitic alopecia*; but usually in this latter affection the patches are merely thinned out and arranged irregularly over the head in streaks; other symptoms of syphilis are frequently present.

The alopecia in patches resembles, in a certain way, alopecia areata, but it has certain characters which are perfectly

pathognomonic. Alopecia areata makes a clean sweep, all the hairs on the patch falling out. In syphilis, however, some hairs always remain on the affected patches, which also are never so regular, rounded, or extensive as those of alopecia areata. Another diagnostic point is that the area-like alopecia of syphilis is always accompanied by the disseminate form, whereas in alopecia areata the hair is usually normal up to the very edge of the bald spot. Finally, alopecia areata decolorizes the skin, which becomes dead-white, while the bald areas of syphilis retain their natural color. Fournier (L'Union Méd., Dec. 4, '90).

Premature Idiopathic Alopecia.—From ordinary alopecia, alopecia areata should be recognized by its white, smooth appearance and rounded, limited form.

Heredity plays a small part in producing early alopecia. Only four incontestable instances were found in over three hundred cases treated. Over 90 per cent. are due to the one disease: eczema seborrhœicum. Two varieties of diplococci, isolated, both of which inoculated upon healthy subjects produced lesions characteristic of the disease. One was a non-chromogenic organism which produced pityriasic manifestations: the other, chromogenic, produced lesions covered with yellowish greasy scales. Both together cause greasy crumbling scales. Elliot (Amer. Derm. Assoc., Sept. 17 to 19, '95).

Trichophytosis.—Microscopical examination in this disease shows at once that no distinct parasite is found in alopecia areata, while in trichophytosis the hair is filled with spores. The hairs, when seized with forceps, become crushed, while they do not yield in alopecia areata.

Case of a boy presenting a perfectly bald spot about two inches in diameter on the top of the head, with the typical features and hair of alopecia areata. It had begun, however, as a scaly patch. Microscopical examination showing the presence of spores, it was pronounced to be trichophyton by Bulkley. Whitehouse (Jour. Cut. and Genito-Urin. Dis., Oct., '93).

Etiology.—In the great majority of cases alopecia areata occurs as a result of contagion. This has been fully demonstrated clinically and experimentally. The implements of the hair-dresser are almost the only agents of transmission of contagion, doubtless because they alone can cause the abrasions necessary for sowing the organism with which contamination occurs. This explains why alopecia areata seems, at first sight, to be a sporadic affection in cities, and why in colleges and barracks it may take the shape of an epidemic. Every disease propagated from one individual to another supposes an active cause capable of multiplication and reproduction,—that is to say, a living pathogenic parasite.

There is a close relationship between tinea tonsurans and alopecia areata. Cases with all the signs of alopecia areata may arise, not in children only, but in adults, from contact with ordinary tinea tonsurans. It is not the bald form of tinea tonsurans, because the short hairs, as in alopecia areata, are club-shaped, whereas, in tinea tonsurans, they are bent and twisted. Crocker (Lancet, Feb. 28, Mar. 7, '91).

Ringworm and alopecia areata are in many ways connected. Of 137 cases of the latter seen by the author, 32 per cent. gave a history of ringworm, either personal or occurring in some member of the household. P. Abrahams (Med. Press and Circular, Nov. 22, '93).

Literature of '96-'97-'98.

Eight boys, all between the ages of 12 and 13, belonging to the same gymnasium—six in one class and two in another—were within a very short time attacked with a most typical alopecia areata: the hair fell out, while the skin remained perfectly smooth without the formation of any crusts or scabs. All

the six pupils were sitting near one another on the same bench. This epidemic proves the contagiousness of alopecia areata beyond any question. Kober (Berliner klin. Woch., No. 15, '98).

Conviction expressed that alopecia areata is contagious under certain circumstances. Lassar (Phila. Med. Jour., Apr. 16, '98).

Alopecia areata may also be caused by shock, worry, overwork, traumatisms, or epileptic paroxysms.

Case following prostration through shock, continued until there was complete denudation of hairy portions of the body. Morton (Brooklyn Med. Jour., Sept., '95).

Case in which a girl, aged 10 years, was operated on for a glandular swelling in the left carotid region. On removing the dressing on the twenty-first day, two circular symmetrical bald spots, about the size of a dollar, were discovered on the back of the neck. These increased in size for seven weeks, when they corresponded to the area supplied by the nervi occipitalis major et minor, and the rear branch of the nervus auricularis magnus. The skin was smooth and normal, and the sensibility not disturbed. Recovery began in five weeks. The compression of the injured cervical nerves by the tampon had probably caused a neuritis. The symmetry was, perhaps, due to invasion by a centripetally-conveyed neuritis. Pontoppidan (Monat. f. prak. Derm., vol. viii, No. 2, '89).

The fact that cases often get well without the application of a parasiticide or other local applications strengthens the neurotic theory; negative results from thyroid extracts. Henry Waldo (Lancet, Aug. 24, '95).

Two instances of alopecia areata occurring in epileptics after paroxysms, in which the neurotic rather than the parasitic origin seems the more probable. The hairs finally recovered their thickness, volume, and color. In both cases alike the evolution of the lesions was not interfered with by any medical intervention, either general or local. Féré (La Nouv. Iconog. de la Salpêtrière, '95).

The neurotic theory of the origin of alopecia areata is still held by many dermatologists.

Prolonged exposure to the vacuum-tube of an x-ray apparatus may give rise to localized falling of hair.

Literature of '96-'97-'98.

Case of dermatitis and alopecia after the use of the Rœntgen rays in a young man, aged 17, in whom experiments were carried out during four weeks, once or twice each day. The dermatitis resembled that caused by burns. An improvement soon occurred. Marcuse (Deutsche med. Woch., July 23, '96).

Case of alopecia areata as a result of exposure to the Rœntgen rays during forty minutes, using a Thompson double-focus or standard vacuum-tube. The distance between the tube and skull was a little over eighteen inches. A large area of hair missing upon that side of the head exposed to the vacuum-tube; no premonitory symptoms of itching or inflammation; the hair had suddenly fallen out three weeks after the exposure.

The integument appeared bald and somewhat elevated, and slightly œdematous; no redness; sensibility not impaired; no scaling. Under stimulating and hygienic treatment downy hairs are beginning to show themselves. F. S. Kolle (Buffalo Med. and Surg. Jour., Dec., '96).

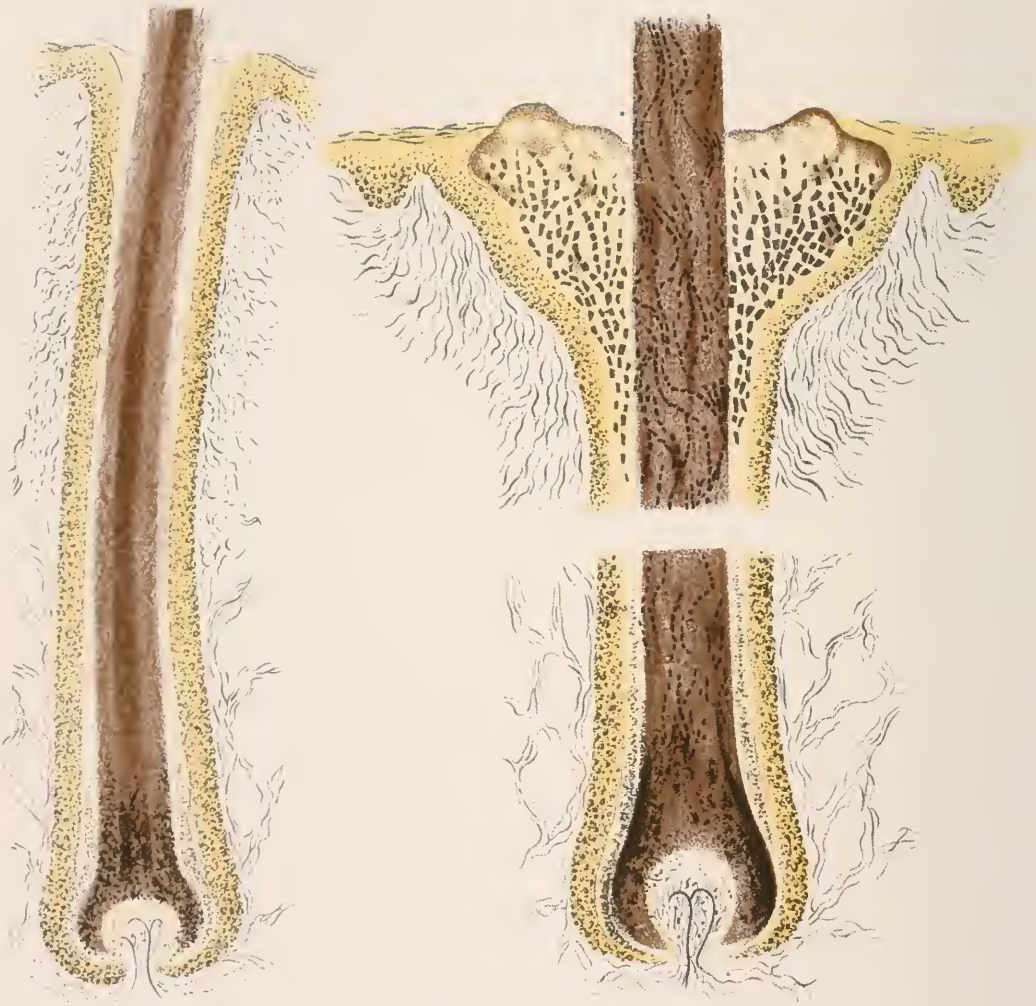
True alopecia areata seems to occur in syphilitic subjects more frequently than in other persons.

The percentage of alopecia areata in various countries is approximately as follows: France, 3 per cent.; England, 2; Scotland, 1.5; Vienna, 0.75; North Germany, 0.75 to 1; America, 0.5. (Crocker.)

In Lille, of 5000 cases of skin disease, 149 cases were alopecia areata; in Lyons, of 2765 cases, 17; in Vienna, of 5000, 40; in Berlin, of 1050, 9; and in another

Fig 1

Fig 2



Alopecia Areata (Sabouraud)

Figure 1 Section of normal hair implanted post on Figure 2 Section of hair showing the peladic utricle

DIAGNOSTIC ET TRAITEMENT DE LA PELADE

series of 3008 cases, 30 were alopecia areata. In America, as shown by the statistics of the American Dermatological Association, alopecia areata was found in 794 cases out of 123,746 cases. E. Besnier ("Sur la Pelade," Travail lu à l'Acad. de Méd., July 31, '88).

Pathology.—The initial stage alone of ordinary benign alopecia areata is microbic. As soon as the patch becomes smooth, microbes can no longer be found, neither in the skin nor in the follicle. In the beginning of the disease almost all the follicles are infected with innumerable microbian colonies belonging to a single bacillary species always the same.

In benign cases the follicular infection is transitory; in chronic or total alopecias the same microbe is found constantly, with the same localizations.

The invariable presence of this microbe wherever there is a beginning lesion gives it a value other than that of an ordinary secondary infection. However, this microbacillus, notwithstanding certain differences of form, cannot be distinguished with absolute certainty from the microbe which Hodara has described as the bacillus of acne. If the bacillus of Hodara and that of alopecia areata are the same, we must ascertain why in every case of alopecia this secondary infection is constant, and what rôle it plays. If they are different, they must be differentiated experimentally. Finally, they may be the same bacilli which, under different vital conditions, may or may not secrete a toxin capable of producing alopecia. (Brocq.)

According to Sabouraud, alopecia and alopecia areata are practically identical. The patch of alopecia areata is only an attack of acute circinated seborrhœa: in other words, the bald only become bald by a diffused process of chronic alopecia areata. Alopecia areata is a contagious disease, the extension of which is marked by the appearance of a special form of hair,—the club-shaped hair. This hair appears with the disease, disappears at the same time that it ceases to extend, and reappears with the renewal of activity. Where the malady is active it is never wanting.

The microscopical examination of the club-shaped hair shows that its special form is due to a progressive atrophy of the papilla which forms it. A histological examination will separate alopecia areata clearly from the cryptogamic tineas.

In 300 cases examined by him, Sabouraud found that all the morbid conditions indicate a pre-existent intoxication, the cause of which had disappeared. In the earlier stages, however, he found that one out of every two or three follicles at the margin showed an ampulliform dilatation at its upper part, which he calls the utricle. (*See colored plate.*) This, when first perceptible, is roofed by a dome having a minute window in its centre. In this cavity alone the microorganism is to be found. So long as the aperture remains closed the microbacillus exists in a pure state, but when it opens it disappears, and saprophytic fungi enter. The bacillus is one of the smallest known, and is in innumerable numbers. It is, according to him, constant in the early stage of the benign form. In total alopecia of this type, there seems to be two stages: in one the bald skin is oily and shining, and in the second it is dry and rather scaly, and in which there is a tendency to restoration of hair. If, in the seborrhœic stage, the contents of the follicles are expressed by massage, the same organisms found in the utricle are recognizable in immense numbers, less numerous in the drier stage, and not to be found when healthy

lanugo hairs begin to clothe the surface. Sabouraud hesitates to pronounce the microbe he has discovered as the causal element, for one both identical in appearance and in reaction to stains has been found habitually in the comedo and in seborrhœa of the oily type.

The microbes which are found in the hair are diverse; they are habitually observed even upon scalps that are not affected with alopecia, but only in hairs which show evidence of papillary alteration anterior to the microbic invasion.

Indeed, none of these microbes, almost all of which have been described by various authors as specific, can, according to Sabouraud, have any causal importance in the disease.

Literature of '96-'97-'98.

Three facts which militate in favor of the infectious nature of alopecia areata: (1) the erythematous tint of recent patches; (2) tumefaction of occipital lymph-nodules, which often accompanies the beginning of the disease; (3) the fact of experimental contagion. Blaschko (Third Cong. of Derm. and Syph., '97).

Alopecia areata is a parasitic disease, and occurs among those who have previously suffered from tinea tonsurans. Hutchinson (Practitioner, vol. lviii, p. 519, '97).

Prognosis.—The prognosis of alopecia areata is exceedingly variable; in many cases treatment must be continued for years.

The more ancient the patch is, the more difficult it is to promote a return of the hair.

Occipital or temporal alopecia areata recovers more slowly than that of other regions of the scalp.

When the hairs begin to grow anew they are frequently white at first, and only later, by the continuance of the treatment, do they resume their normal hue.

Treatment.—The general treatment usually recommended has for its object to strengthen the patient. Increased nutrition and general tonics play an important part in the methods indicated. Country-air, physical exercise, rest from mental overwork, warm sulphur shower-baths (Besnier and Doyon), cold shower-baths on the vertebral column, iodide of iron, codliver-oil, strychnine, sodium arsenate, the preparations of cinchona, and the valerianates have each their sponsors.

Food containing much butter, fat and milk, phosphates and fish, strychnine, and phosphoric acid are of service.

Patients should be well fed. The fats and phosphates should be increased. Milk taken alone and between meals, crushed wheat, cream, and fish the most valuable aliments for this purpose. The best results have been obtained under the free and continued administration of strychnine with phosphoric acid. Arsenic should be given alternately with the former. Bulkley (N. Y. Med. Record, Mar. 2, '89).

The progress of the disease must be arrested by shaving the hair around each patch for about half an inch or, even better, by shaving the entire head. Epilation may be done, instead of shaving, around the bald patches. (Brocq.)

To effectively treat alopecia areata, it is necessary to act upon the derma, and the horny layer must first be destroyed by the application of a vesicating fluid, preferably the ethereal solution of cantharides. On the following day a 15-per-cent. solution of nitrate of silver is applied upon the denuded chorium, with or without previous cocaine anæsthesia. This may be renewed in ten or fifteen days if necessary. The results of this treatment greatly surpass in

effectiveness those following other procedures. (Sabouraud.)

The success of epilating a ring of hairs in the early stage as a means of protective demarkation against extension is explained, if Sabouraud's discovery should be verified.

In facial alopecia areata rubbing of the affected region daily with tincture of cantharides, either pure or mixed with spirit of rosemary, according to the irritability of the skin, is another valuable measure.

℞ Tincture of cantharides, 1 ounce.
Spirit of rosemary, 2 drachms to 1 ounce.

The hair should be cut short, Van Swieten's solution rubbed in, and each diseased patch painted with a thick coating of 1 part of iodine to 30 of collodion. At the end of a week this film loosens and begins to separate. Frictions with the sublimate solution are then used, morning and evening, until all the remaining pellicles of collodion have been removed, when a new coating of iodized collodion is applied. After three applications the downy, new hairs begin to appear. Tison (Jour de. Méd., Apr. 24, '92).

Antiseptic preparations have been recommended by a large number of authorities.

In parasitic alopecia areata (trichophytosis) the hair is cut close, and a solution of corrosive sublimate (1 to 750) or, preferably,—on account of its non-toxic qualities,—a 3-per-cent. solution of creolin is applied. This is used all over the scalp as a preventive. Sapo viridis is rubbed into the affected areas, and allowed to remain on for five minutes. After washing this off, a small quantity of the following ointment is rubbed in:—

℞ Hydrarg. bichlor., 1 grain.
Lanolin, 1 ounce.
To be thoroughly mixed.

The latter should be applied twice daily, as a usual thing, but sometimes a less frequent application suffices.

Literature of '96-'97-'98.

The following salve is recommended for baldness of parasitic origin:—

℞ Pilocarpine, 4 parts.
Precip. sulphur., 10 parts.
Balsam of Peru, 20 parts.
Beef-marrow, 100 parts.
M. Sig.: For external use. Sabouraud (Medical News, Jan. 15, '98).

In neuritic alopecia areata the same internal treatment is used as in presenile alopecia. Externally, in some cases, cantharidal collodion is applied to the affected area, and, after vesication has been established, a dressing of some bland ointment. As the collodion varies in its effect, it is to be applied at greater or less intervals.

Bulkley's method, with some modifications, is as follows: The pure carbolic acid is applied twice a week, and over the entire area of the patch, however large, by freely swabbing. Those portions which are affected by the acid turn milky white in a few moments, and, if they do not do this, are touched again after awhile. If the parts that turn white show any very marked inflammatory action, they are passed over at the next sitting. Generally, however, there is, at most, but a slight amount of desquamation. (Ohmann-Dumesnil.)

Affected area covered with solution of corrosive sublimate in glycerin, 1 to 100. The scalp is then tattooed with a sharp instrument: an aseptic needle, for instance. The punctures need only be slight,—sufficient to permit penetration of the antiseptic. Successful results in

most inveterate cases. M. A. Martin (Gaz. des Hôp., July 9, '95).

Case of alopecia areata of the beard treated by Martin's method of locally-applied mercuric-bichloride solution, made to penetrate the follicles by electricity. Beall (Va. Med. Monthly, Feb., '91).

Literature of '96-'97-'98.

Successful treatment of alopecia areata by means of lactic acid, applied gradually in increasing strengths, beginning with a 50-per-cent. solution. Ristema (British Jour. of Derm., July, '98).

The local use of strong solutions of carbolic acid has been advocated by Duhring and Bulkley.

Three cases cured in five weeks by painting the patches with iodized collodion, 1 to 30. It is supposed that the impervious coating formed by the collodion kills the micro-organism. Chatelain (Revue Gén. de Clin. et de Thér., Dec. 31, '90).

A 95-per-cent. solution of carbolic acid is applied to the affected region and its periphery. It is somewhat painful at first. The skin whitens, shrivels, and desquamates. Two weeks later a second application may be made. Bulkley (Jour. Cut. and Genito-Urin. Dis., Feb., '92).

The scalp is thoroughly washed for ten minutes with tar-soap, first using hot water, then cold. The parts having been thoroughly dried, a solution of bichloride of mercury, 1 to 900 (equal parts of water, glycerin, and cologne), is rubbed in. The scalp is then anointed with a pomade containing

℞ Salicylic acid, 2 parts.
Tincture of benzoin, 10 parts.
Neat's-foot oil, 100 parts.—M.

This treatment should be carried out daily and continued for six weeks or more. Lassar and Groetzer (Brit. Jour. of Derm., Feb., '91).

The methods advocated by Besnier and Doyon are much employed on the continent of Europe.

Every morning the head is washed with warm water and tar-, ichthyol-, or naphthol- soap, followed by rubbing in a weak alcoholic liniment:—

℞ Spirit of lavender, 4 ounces.
Salol or salicylic acid, 7½ grains.
—M.

Every evening the following ointment should be applied:—

℞ Peruvian balsam,
Salicylic acid,
Resorcin, of each, 15 grains.
Precipitated sulphur, 2½ drachms.
Lanolin,
Vaselin, of each, 14 drachms.

Every morning the patches and their immediate neighborhood should be lightly rubbed with a piece of absorbent cotton dipped in the following solution:

℞ Chloral-hydrate, 4 scruples.
Ether, 7 drachms.
Crystallized acetic acid, 15 to 60 grains.—M.

Or in a mixture of acetic acid and chloroform varying in strength according to the susceptibility of the patient.

If the face be affected, it should be washed every morning with warm water to which a small quantity of one of the antiparasitic solutions mentioned above has been added.

Every morning the bald patches are to be lightly rubbed with a piece of absorbent cotton dipped in the following solution:—

℞ Chloral-hydrate, 15 to 60 grains.
Ether, 7 drachms.
Crystallized acetic acid, 7 to 30 grains.—M.

This is to be repeated as often as may be necessary to maintain the bald patch in a state of slight hyperæmia.

When the trunk and limbs are affected

the treatment should consist in sulphur, salt, with electric baths, and in rubbing the body with a horse-hair brush dipped in a stimulating liquid:—

℞ Resorcin, 2 drachms.
Orange-flower water, 12 ounces.—M.

Morrow recommends the following procedures:—

Constitutional means of improving the general nutrition are at once begun. The hair is clipped around the affected patches, the loose hairs are removed, and the following preparations are then applied:—

℞ Chrysarobin, 20 to 40 grains.

With or without

Salicylic acid, 10 to 15 grains.
Ointment of gutta-percha, 1 ounce.

A moderate dermatitis should be excited and maintained.

When the alopecia is severe and extensive the scalp is shaved and acetic acid is applied in greater or less proportion, mixed with equal parts of chloroform or ether, producing a superficial vesiculation followed by desquamation.

Between the applications the bald spots are anointed with a stimulating oil:—

℞ Eucalyptus,
Turpentine, of each, ½ ounce.
Crude petroleum,
Alcohol, of each, 1 ounce.—M.

This is followed by a thorough massage of the scalp by the patient. Once a week or oftener the scalp is thoroughly shampooed with tincture of green soap. At a later stage sulphur and resorcin ointments and salt-water douches may be used.

For the face weaker solutions of acetic acid should be employed, or applications of a mixture of equal parts of tincture of capsicum or tincture of cantharides and glycerin be made. For the body mercurial and tar-soaps and sulphur-baths are to be used.

Chrysarobin is the best remedy, prepared as follows: A stick composed of

℞ Chrysarobin, 30 parts.
Resin, 5 parts.
Yellow ointment, 35 parts.
Olive-oil, 30 parts.

is rubbed every evening over the affected part, which is washed clean with olive-oil in the morning. In some days the skin becomes irritable and red, when zinc ointment is substituted for a time. Leistikow (Thér. Monat., Jan., '94).

The loose hair around the patches should first be pulled out, and, when practicable, from ½ drachm to 1 drachm of chrysarobin to 1 ounce of lanolin and oil is one of the best applications. Crocker (London Lancet, Feb. 28, '91).

Pilocarpine, locally and internally, has been recommended, but this agent is expensive, a fact militating against its use in ointments.

Internal medication is only of use in the late stage, when the disease is not spreading, but only the dormant vitality of the hair-follicles requires awakening. Then pilocarpine may be given with advantage, internally, in the dose of $^1/_6$ to $^1/_4$ grain at bed-time. This drug may also be given hypodermically, in the dose of $^1/_{10}$ to $^1/_6$ grain, but at the patient's house, lest nausea and faintness occur. Crocker (Lancet, Feb. 28, Mar. 7, '91).

Literature of '96-'97-'98.

The following ointment is highly recommended:—

℞ Pilocarpine,
Quinine, of each, 4 parts.
Precipitated sulphur, 10 parts.
Balsam of Peru, 20 parts.
Beef-marrow, 100 parts.—M.

Sabouraud (Concours Méd., June 19, '97).

Resorcin has given satisfactory results in the early stages.

Electricity is sometimes of value. The negative pole of a battery of from four to ten cells should be applied to the bald spot sufficiently long to produce a redness of the skin. It should be used only in connection with other remedies. (Hayes.)

Case of alopecia areata, treated without result by antiseptics, in which the application of the faradic current to the scalp caused recovery. Blaschko (Ann. de Derm. et de Syph., p. 314, '92).

Electricity is without effect. Morrow (Jour. Cut. and Genito-Urin. Dis., Oct., '91).

Currents of high tension and of high frequency are effective in alopecia areata. D'Arsonval (Bull. Gén. de Ther., July 15, '95).

Literature of '96-'97-'98.

The galvanic current is, perhaps, the best stimulant that can be used; but as the patient cannot conveniently have electricity applied two or three times a day, it is more advisable to prescribe some stimulating lotion or ointment.

An ointment of chrysarobin, from 3 to 10 per cent. in strength, can be recommended as an effective application. In prescribing this the physician must not forget to mention the fact that it will stain the bed-linen, and caution the patient not to get any ointment in his eyes lest a severe conjunctivitis result. George Henry Fox (Amer. Jour. of Obst., Jan., '96).

George H. Rohé,
Baltimore.

ALPHOL.—Alphol is a salicylic ether of alphanaphthol (Merck) and an isomer of betol (the salicylic ether of betanaphthol), obtained by heating together sodium salicylate, sodium alphanaphtholate, and phosphoric oxychloride. The product being freed from sodium chloride and sodium phosphate by treatment with water, it is then purified by repeated crystallization from alcohol. Therapeutically, it is said to resemble salol. By the action of the pancreatic and intestinal juices it is split up into salicylic acid and alphanaphthol.

Dose.—The ordinary dose ranges between 7½ and 15 grains, which may be increased to 30 grains.

Therapeutics.—It is reported to have given good results in gonorrhœal cystitis and acute articular rheumatism; and it has also been employed as an antiseptic and antineuralgic, like most of the compounds of naphthol.

ALUM.—The alum generally used is an aluminium and potassium sulphate. This salt is likewise official in the U. S. P. It occurs in the form of translucent, whitish, octahedral crystals having a sweetish and strongly-astringent taste. Alum is soluble in water, insoluble in alcohol, and soluble in heated glycerin.

Physiological Action.—Alum is an active astringent. It coagulates albumin, and when, therefore, it is applied to moist mucous membranes, it causes them to turn white. This is intensified by its power over the blood-vessels of the part, which it firmly contracts, probably by stimulating the local vasomotor nerves. It also contracts the tissues, depleting them of their blood. Upon the blood itself it acts as an effective coagulant, and is, therefore, an excellent styptic.

When administered to animals, such as dogs, cats, and rabbits, by subcutaneous injection, a soluble salt of alum causes no symptoms at all for three or four days. Then the animal experimented upon suffers from loss of appetite and obstinate constipation, emaciation, languor, and disinclination to move. Next there is vomiting and loss of sensibility, as a deep prick with a needle is scarcely felt. When forced to move, the leg is raised, but trembles and

twitches violently, and is with difficulty placed on the ground. Sometimes there is general tremor or convulsive twitching and sometimes extreme weakness or partial paralysis of the posterior extremities. There is complete loss of sensibility to pain, while the animal retains its senses. Then the power of moving the tongue and of swallowing is completely lost; even the saliva cannot be swallowed. The symptoms are precisely those of human acute bulbar paralysis. (Mayer and Siem.)

Alum is credited with antiseptic power by some observers, a quality probably due to its property of coagulating albuminoid bodies. When ingested in sufficient quantities alum irritates the gastric mucous membrane and causes vomiting.

Therapeutics.—Alum may be said to be useful as an astringent in all catarrhal conditions of the mucous membranes—those of the upper air-passages, the vagina, and the urethra particularly—in aqueous solutions of from 5 to 20 grains to the ounce. Strong solutions are rarely indicated, their secondary effects being those of undue stimulation,—namely, irritation.

Laryngology.—In diseases of the nose and throat the best effects are obtained from a 15-grain-to-the-ounce solution frequently applied. In acute coryza the following snuff is effective if used early:—

℞ Alum, 3 grains.
Morphine sulphate, 2 grains.
Cocaine hydrochlorate, 1 grain.
Camphor,
Bismuth, of each, 2 drachms.
To be thoroughly mixed.

Sig: To be used as snuff every two hours, a small quantity being used in each nostril.

The glycerite of alum (a 10- to 20-per-cent. solution of alum in glycerin—heat is necessary to produce such a solution of the salt) is very effective in subacute inflammatory disorders of the pharynx and larynx, especially if there is a tendency to œdematous infiltration.

As a styptic alum is a valuable agent. It is found almost everywhere and is easily dissolved with the fluid always at hand, water.

Typhoid Fever.—As an astringent for the intestinal hæmorrhage sometimes occurring in the course of this disease it has been recommended by many clinicians, Whitla especially. It is also thought to act as an antiseptic.

> Sixty cases of typhoid fever treated with alum alone with excellent results. Its virtue lies in its antiseptic power. It is indicated in abnormal fermentations in the intestinal canal. Paoletti (Brit. Med. Jour., Feb. 4, '88).

Epistaxis.—In epistaxis alum sometimes acts rapidly, a saturated solution being used. Pledgets of cotton dipped in this solution are packed in the bleeding cavity and left in until all danger of recurrence has passed,—generally about twelve hours. The solution may be sprayed in in slight hæmorrhages or powdered alum may be taken as snuff.

Metrorrhagia.—In uterine hæmorrhages of all kinds alum is an excellent styptic. R. Beverly Cole has recommended the insertion into the uterine cavity of an egg-shaped piece of alum. The styptic effect is not only produced, but the tissues and the organ itself are stimulated and caused to firmly contract.

Croup.—As an emetic, alum is very frequently employed in children, a teaspoonful may be dissolved in six tablespoonfuls of syrup and water, equal parts, and a teaspoonful administered every fifteen minutes until the desired

effect is produced. This sometimes serves to quickly arrest an impending attack of croup, the astringent effect of the salt upon the mucosa of the throat counteracting the local hyperæmia.

ALUMINIUM. — Numerous preparations have been obtained from this metal, —a boroformate, a borotartrate, a hydrate, a borotannate, and a sulphate. The double salts of aluminium are recommended as powerful antiseptics, superior to carbolic acid and sublimate in being strongly disinfecting, though but slightly poisonous. The best of them is the acetotartrate, prepared by mixing a 5 to 100 solution of basic acetate of aliminium with a 2 to 100 solution of tartaric acid and evaporating to dryness. It crystallizes in shining needles, which smell slightly of acetic acid and are freely soluble in water, but insoluble in alcohol. (Athenstadt.)

Boroformate.—The boroformate is a valuable preparation which combines astringent and antiseptic properties, although the latter cannot be considered as being marked. It occurs in the form of pearly scales crystallized from a solution prepared by saturating, with freshly precipitated and well-washed aluminium, a solution of 2 parts of formic acid and 1 part of boric in 6 or 7 parts of water. It is an hygroscopic salt, dissolving completely, though slowly, in water. The solution has an astringent, sweet taste, and does not coagulate solutions of albumin.

> Boroformate of aluminium has been used in the Prince of Oldenberg's Children's Hospital at St. Petersburg, where it has supplanted all other preparations of aluminium. Martenson (Pharmaceutische Centralhalle für Deutschland, No. 41, '94).

Borotartrate.—The borotartrate, or "boral," is a combination of aluminium, boric acid, and tartaric acid and forms white crystals, non-irritant, antiseptic, freely soluble in water, and valuable in diseases of the nose and naso-pharynx; it is useful in erysipelas, and, in solution with tartaric acid, has given good results in gonorrhœa.

Borotannate.—The borotannate, or "cutol," is a combination of aluminium, boric acid, and tannic acid, and is a brownish, insoluble powder. It combines with tartaric acid to form soluble cutol. Cutol may be prescribed for ointment and is of great service in the treatment of weeping eczema and pruriginous affections in the following formula:—

℞ Cutol, 1 drachm.
Olive-oil, 2½ drachms.
Lanolin, q. s. to make 10 drachms.

When the secretion has disappeared the following powder may be used:—

℞ Cutol,
Oxide of zinc,
Talc, of each, 2½ drachms.

Soluble cutol gives good results in the treatment of burns of the second degree, and a solution of soluble cutol and glycerin, 1 to 10, applied locally, causes rapid retrogression of follicular angina. The same solution may be employed in catarrhal metritis. Cutol may also be employed in the treatment of hæmorrhoids.

> For hæmorrhoids an ointment containing 10 per cent. of cutol may be applied, while fissures of the hands may be treated by applications of
>
> ℞ Cutol, ¾ drachm.
> Oil of sweet almonds,
> Lanolin, of each, 3¾ drachms.
> Orange-flower water, 2½ fluidrachms.
>
> Koppel (Ther. Monat., Nov., '95).

Hydrate.—The hydrate of aluminium is prepared by decomposing a solution of an aluminium salt by an alkali or alka-

line carbonate. It is a light, white powder, soluble in acids and fixed alkalies. This is also a light astringent, employed in skin affections.

Sulphate.—The sulphate of aluminium, prepared by dissolving aluminium hydrate in sulphuric acid, is soluble in water, but insoluble in alcohol. Injected in the blood it induces powerful contraction in the capillaries, especially those of the lung. It is used in strong solution as an antiseptic in diseases of the nose, throat, uterus, and vagina, and as a lotion for foul ulcers, vaginal discharges, etc.

ALUMNOL is an aluminium salt of the naphthol-sulphur acids. It is a fine, white, non-hygroscopic powder, easily soluble in cold water, slightly so in alcohol, and insoluble in ether. Its unirritating quality in weak solutions makes it available for the treatment of cavity wounds and chronic catarrhal processes. In acute cases, however, it is usually irritating.

Mode of Employment.—It is not incompatible with sublimate, resorcin, etc., and may be combined with them in order to strengthen their reciprocal action, if it is desired to combine the action of several antiseptics.

Therapeutics.—A general review of the literature does not warrant a final opinion as to its merits, but the published reports, a few of which are given below, do not indicate that it is worthy of much confidence in the treatment of the genito-urinary tract,—its main stronghold. It has been tried in gynæcological, dermatological, surgical, and laryngological cases as an astringent, and when used in weak solutions seems to have given more encouraging results.

Gynæcology.—In $^1/_2$ to 1-per-cent. solution it has been found useful in endometritis of gonorrhœal origin, and in colpitis, if non-gonorrhœal in character. (Heinze and Liebreich.)

> Numerous experiments, in cases of acute blennorrhagia in the male, with aqueous solutions of from ½ to 5 per cent., either as injections, urethral irrigations, or instillations with Guyon's or Ultzmann's sound. In acute cases it soon produced a certain irritation; in chronic cases it was better supported, but the duration of the treatment was no shorter than with other remedies. In blennorrhagia in the female the patients, both acute and chronic cases, were cured in from two weeks to two months. The remedy was applied as a vaginal injection with the aid of the speculum, or by tampons introduced into the cervical canal. Schwimmer (Univ. Med. Jour., May, '94).
>
> Used in sixteen gynæcological cases: catarrh of the neck and endometritis with or without inflammation of the annexa. Cervical catarrh and simple perimetritis yielded to its repeated use. In endometritis complicated with lesions of the annexa the pains were augmented on account of the irritation produced. Gonorrhœal vaginitis was readily cured. The following preparations were used: A solution of 3 per cent. for lavages; a powder and bougies of 20 per cent.; and a 10-per-cent. solution as an astringent in the treatment of endometritis and of erosions. A. Kontz (Wiener med. Presse, No. 18, '93).
>
> Tried in 12 cases of acute gonorrhœa, 20 chronic cases (in 8 of which gonococci were present), 4 cases of gonorrhœal epididymitis, 2 of post-gonorrhœal adenitis, and 2 of soft chancre. In the first cases mentioned, treatment was begun by intra-urethral injections of a 1- to 2-per-cent. solution of alumnol three times daily. Later the same solution was used once daily, or else a feebler solution (from 0.25 to 1.00 per cent.) several times during the twenty-four hours. In 8 cases treatment was begun from one to three days after the appearance of the secretion, and from three to ten days in the other 4 cases. The drug was not found superior to any other drug

generally used. Found inferior to nitrate of silver. Cases of soft chancre were the ones cured. Casper (Berliner klin. Woch., No. 13, '94).

That alumnol does not possess the antigonorrhœal merits granted it by Chotzen shown by a trial in twelve cases. E. Samter (Berliner klin. Woch., No. 13, '94).

Literature of '96-'97-'98.

Marfan uses bougies of alumnol, 3 per cent., in the treatment of vulvo-vaginitis. M. Storer (Boston Med. and Surg. Jour., Jan. 20, '98).

Surgical Dressing.—In the dressing of wounds and in ulcerations of specific or non-specific character it produces, according to Eraud, no irritation or pain. This author considers it as efficacious as other powders for the desiccation of wounds. It appeared to be useful in certain varieties of pruritus, especially that of the anus and scrotum.

Laryngology. — Alumnol has been found valuable in simple chronic and hypertrophic rhinitis, ozæna, catarrhal and follicular tonsillitis, and acute and chronic catarrhal and follicular pharyngitis, in a 1-per-cent. solution as a douche; in a watery, glycerin solution (1 to 5) for application to the affected parts; or in a powder mixed with starch (10 to 20 per cent.) for insufflation.

In acute laryngeal affections the roughness of voice generally disappeared after a single inhalation of a 1-per-cent. solution. In chronic cases good results were obtained by the use of insufflations of a mixture of alumnol and starch (2 to 10 per cent.). A 1-per-cent. solution was of signal service as an hæmostatic in cases of hæmoptysis. A. Stepanicz (Annual, '95).

Literature of '96-'97-'98.

Two years' experience showing that alumnol is of the greatest value as an astringent, especially in conditions accompanied by œdema, whatever be the direct cause of the latter. Metzerott (Amer. Therapist, Sept., '97).

Dermatology. — It has been found ful in powder, 12 to 25 per cent.; collodion, 5- to 10-per-cent. strength; and ointment, 1, 5, and 12½ per cent., in dermatitis, in acute eczemas of all sorts, in chronic eczemas; in syphilis and the parasitic skin affections it was not of much benefit. In acne and rosacea as good results have been obtained by it as by most methods of treatment. (Gottheil.)

Found efficacious in acute superficial inflammatory affections of the skin, as well as in chronic processes in which the inflammation was deeper; in parasitic diseases, such as erysipelas, favus, lupus, soft chancre, and erosions; and in acute and chronic inflammations of the mucous membrane. Chotzen (Berliner klin. Woch., No. 48, '92).

AMBLYOPIA. See diseases in which it occurs as a symptom.

AMENORRHŒA. — (Lat.). From ἀ, priv.; μήν, a mouth; and ῥεῖν, to flow.

Definition.—Absence of the menstrual flow in women of a suitable age who are not pregnant. Suppression of menses, the menstruation having ceased through some local or remote disorder, is also termed amenorrhœa.

Varieties.—Amenorrhœa may be *complete*, when the menstruations have completely ceased; *comparative*, when it appears occasionally; *primary*, when the menstruation has not presented itself at the age of puberty nor subsequently; *secondary*, transitory or accidental, or when, having already appeared, the menstruation ceases.

Symptoms.—No other symptom than absence of the menstruation may be present, or the monthly flow may be absent and the general attendant phenomena

usually preceding menstruation occur. Frequently the patient complains of headache, heat-flashes, fever, nausea and vomiting, and heaviness in the abdomen. Concomitant nervous disorders may form the basis of acute manifestations, hysterical especially. When the retention is due to uterine stricture, there is considerable pain radiating from the uterus to the surrounding parts, including the lumbar region.

Pure suppression of the menstruation usually gives rise to no symptoms, especially when the impending general disorder is the cause of the amenorrhœa. When, however, it is due to a local disturbance, the symptoms of a congestive disorder of the genital tract appear, soon followed by an inflammatory process, which may be general or local. Peritonitis sometimes appears as a result of such a process. Remote symptoms may also present themselves, doubtless of reflex origin.

Case in which intense ciliary neuralgia and photophobia were caused by suppression of the menses. There was congestion of the choroid and retina, with slight pallor of the optic disc. Plimpton (Jour. of Ophthal., Otol., and Laryn., Jan., '91).

Literature of '96-'97-'98.

Amenorrhœa virginalis a new disease, in no way connected with cessation of menstruation from chlorosis, anæmia, etc., which occurs in young women. The first symptom is the amenorrhœa, which may or may not be associated with vicarious menstruation. After awhile cardiac symptoms supervene, especially palpitation, dyspnœa, and cyanosis; the right heart fails, and œdema and death result. Two such fatal cases. The suppression of the menses led to general plethora, cardiac hypertrophy, valvular incompetence, and finally pulmonary congestion. Edelheit (Wiener med. Presse, Aug. 16, 23, '97).

Etiology.—In cases of primary menstruation imperfect or insufficient development is the most usual cause. In cold countries, where growth of the system at large is more gradual, the menstruation appears later than in the warmer countries, where development is rapid, but where, also, women enter the stages of decrepitude earlier. Anatomical imperfections and anomalies, the absence of any of the genital organs, or a rudimentary or infantile uterus may thus account for the total absence of menstruation. Imperforate hymen is a frequent, though easily recognized, cause.

On general principles, the causes of amenorrhœa may be divided into four classes:—

Nervous Disorders.—Grief, anxiety, fright, and anger are as many possible primary causes, especially if the patients are poorly fed. Women who either greatly fear or greatly desire to become pregnant, newly-married women, and women who are confined in prisons or insane-asylums furnish a large proportion of the cases. Removal from country to city or *vice versâ*, especially when coupled with nostalgia, is a prolific cause. On general principles, change in the mode of living or of climate, especially with an intervening sea-voyage, appears to frequently act as the etiological factor.

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Probably not less than 33 per cent. of women emigrants under 30 years of age suffer from suppressed menstruation after a sea-voyage. Many have abdominal distension, and not infrequently girls have been innocently charged with being pregnant. Obstinate constipation a common symptom. The true etiology is largely psychical and neurotic. H. C. Bloom (Univ. Med. Mag., Dec., '96).

In those cases where the follicular stroma of the ovary has been the seat of

an inflammatory process during the infectious fevers, the patient may have an amenorrhœa which may remain and become permanent. Alexander Simpson (Practitioner, Aug., '98).

General Affections.—Amenorrhœa frequently occurs after a serious illness, such as typhoid fever, eruptive fevers, mumps, pneumonia, or during the course of any chronic disease, diabetes, cancer, malaria, at the onset of severe syphilis, or when any intoxication of the system occurs, as in morphinism, alcoholism, and hydrargyrism.

Eighteen cases in which the morphia habit caused amenorrhœa. It is usually complete and accompanied by loss of sexual desire, but the functions are re-established if the habit be broken. Lutaud (Revue Gén. de Clin. et de Thér., May 2. '89).

It may be consequent upon an acute or chronic surgical affection, a blow, or injury. Luxurious living and want of exercise, obesity, and excessive intellectual labor at the period of puberty, when not counterbalanced by fresh air and active exercise, may retard the development of the generative organs and thus induce the disorder.

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Case of a young woman who presented many of the usual signs of pregnancy, including cessation of the menses, prominence of the abdomen, etc. On examination deposits of adipose tissue were found in the abdominal walls, while the uterus was small—smaller, indeed, than usual. Subsequent events proved it to be a case in which obesity had led to disturbance, if not, indeed, early appearance, of the menstrual function. Robert A. Reid (Mass. Med. Jour., Aug., '98).

Blood Disorders and Wasting Diseases.—Anæmia and idiopathic chlorosis, pernicious anæmia, leukæmia, and Hodgkin's disease are the most prominent factors. The following causes of waste—and directly, therefore, of amenorrhœa—are also to be remembered: Hæmorrhage, albuminous discharges; hæmorrhage from piles, scurvy, purpura, and injury, as in hæmophilia; hæmorrhage from the stomach, as in gastric ulcer; from the lungs, or from the nose, and from a rare disease produced by a parasite in the duodenum,—the anchylostoma duodenale. Long-continued suppuration, albuminuria, chronic diarrhœa, malignant ulcers, tubercular disease, all impoverish the blood, and so may cause anæmia. All diseases that cause wasting of the body finally cause the menstruation to cease. Chief among these are phthisis, diabetes, caries of bone, protracted or febrile illness; anorexia nervosa, the patient wasting because she will not eat; and gastric ulcer.

Lesion of Genito-Urinary Organs.—Any lesion of the genital apparatus may cause amenorrhœa, especially metritis, endometritis, and parametritis (both acute and chronic), and flexion or malposition of the uterus. Adhesion due to a previous pelvic peritonitis is an occasional cause of hyperinvolution of the uterus following pregnancy. Atrophy of the ovaries, senile atrophy following pregnancy, and cystic ovarian degeneration are among the less common etiological factors. A most complete examination of the pelvic organs should be made, if necessary, under ether in such cases.

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Case of absolute amenorrhœa in a married woman 26 years old. The external os was patulous, and a probe entered the canal of the uterus a distance of 4.7 centimetres, and after traction on the cervix and using slight force, the point of the probe passed a tight constriction a farther distance of 1 centimetre, making the total uterine depth 5.7 centi-

metres, or 2¼ inches. Examination showed evidences of an old, inflammatory process about the tubes and ovaries, resulting presumably in atrophy of the ovaries, chronic inflammation of the tubes, and stenosis of the uterine canal, besides anchoring the uterus in a pathological position in the pelvis. History of varioloid, severe fall, and hereditary tuberculosis. W. L. Burrage (Boston Med. and Surg. Jour., Oct. 14, '97).

Amenorrhœa due to complete occlusion of os uteri following labor. Labor normal; she was in bed thirteen days, and had had some fever (101°), for which the nurse gave intra-uterine injections. Crampy abdominal pains lasting for three days; recurred from fourteen to twenty-one days for several times, then every twenty-five days, this being her regular type of menstruation. Not a drop of blood was passed. Examination revealed considerable laceration of perineum and cervix. Under ether anæsthesia uterine canal dilated, and a solid glass stem was worn for nine weeks. Two weeks later menstruation returned normally and painlessly, and has recurred every twenty-five days. L. G. Baldwin (Med. News, Nov. 14, '96).

If menstruation does not appear at the age of puberty, a careful scrutiny on the part of the physician is obligatory and imperative. Case of a young woman, 24 years of age in whom the amenorrhœa was of organic origin. A dermoid and a suppurating multilocular cyst were found and removed. Report of the pathologist harmonizes with the theory of the case both from physiological and pathological stand-points: 1. That the dermoid had usurped the place and destroyed the function of the right ovary. 2. In one of the cyst-walls of the multilocular ovarian cyst was found a shrunken ovary the size of a large lima-bean, and within this ovarian stroma was found a corpus luteum spurium. To the presence of this ovarian stroma was due the womanly development, with ovulation and the futile effort of menstruation and its consequent suffering. 3. The case demonstrates the possibility of ovulation without menstruation. 4. It leaves doubt whether the absence of the oviducts was primary or secondary to the grave disease of the ovaries, with the possibility that they were congenitally absent. 5. It presents the rare and exceptional condition of a perfectly-developed woman who had an ovary and a uterus, who ovulated, was sterile, and never menstruated, and yet was ruined in health by Nature's effort to establish an impossible normal function. W. B. Chase (Amer. Jour. of Obstet. and Dis. Women and Children, Oct., '98).

Exposure to cold during menstruation, by inducing congestion of the pelvic organs, is one of the most active exciting causes, especially when supplemented by a local chronic disorder.

The most important condition with which this disorder might be confounded is pregnancy. The reader is referred to the article under that head.

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Case of a healthy girl, aged 15, who had been subject for a year to gradual swelling of the abdomen. The period had ceased for two months only. The breasts became hard and tense. The hymen was intact. Peritonitis of tuberculous origin suspected. On opening the abdomen an enormous cyst, which contained twenty pints of fluid, discovered. Its pedicle was twisted and had risen in the parovarium. On the day after the operation the catamenia reappeared and the abdomen soon resumed its normal form. Cortiquera (Anales de Obst., Gine., y Ped., Jan., '96).

Pathology.—A pathological identity can hardly be attributed to amenorrhœa, owing to its complex causes, the diverse physiological conditions peculiar to the cases, and the diathetic conditions that may be present. The fact that the true nature of menstruation itself is not known adds another objection; and it may safely be said that the pathology of amenorrhœa is that of the diseases causing it, until the local disorders

brought about by each will have been determined. The following extracts are given to indicate the present trend of thought regarding the cause of menstruation.

Blood-pressure varies greatest at the commencement of menstruation, least immediately after; remains about the same height seventeen days, when it again begins to rise. Derangement of this cycle leads to various pathological phenomena. A. W. Johnstone (Amer. Jour. of Obstet., May, '95).

Evidence recently furnished by Heape justifying opinion that ovulation is not the cause of menstruation. We should not speak of menstruation as occurring once a month, but as occupying a whole month. Lawson Tait (Provincial Med. Jour., Jan. 1, '95).

All evidence favors the theory that ovulation and menstruation are independent; ovulation in a modified form continues during pregnancy. Byron Robinson (Amer. Gyn. and Obst. Jour., Aug., '95).

Study of over three thousand cases showing that earlier menstruation in tropical countries is not due to climate, but to too early sexual excitement. Joubert (Indian Med. Gazette, Apr., '95).

Diagnosis. — Primary amenorrhœa — that is, total absence of menstruation — is usually due, as already stated, to the absence of one or more of the organs of generation. It must be distinguished from retention of the menses, due to atresia of the cervical canal, of the vagina, or of the vulva. In the latter case no menstruation has existed, but the general premonitory symptoms of menstruation have occurred, though followed by no menstrual flow. Cases in which one or more of the organs are absent are not very infrequent, while cases of imperforate hymen are comparatively common.

Case of total absence of the vagina, uterus, and appendages in a married woman consulting the author for the relief of amenorrhœa, sterility, and dyspareunia. Kakushkin (St. Louis Med. and Surg. Jour., Nov., '89).

[Two similar cases recently seen at the New York Polyclinic, where the misfortune of marriage would have been avoided had a vaginal examination been attempted previously by the patient's physician. MUNDE, Assoc. Ed., Annual, '90.]

Prognosis.—Amenorrhœa due to absence of any of the organs is, of course, incurable. The same may be said of cases in which the approach of menopause or other conditions pointing to senility of the uterus. Although amenorrhœa, when due to a serious chronic disease, is usually cured with difficulty, hope may always be entertained when the causative disorder is not in itself a fatal one. Return of the menstruation in any chronic disorder, when the blood presents its normal appearance, is an encouraging sign.

[The prognosis of secondary atrophy with amenorrhœa depends greatly on the condition of the ovaries, and is practically hopeless if they are atrophied. MUNDE, Assoc. Ed., Annual, '90.]

Treatment.—Women who object to becoming pregant represent a large proportion of the cases of amenorrhœa met with. Special care, therefore, should be taken not to administer emmenagogues, under such circumstances, or to introduce instruments into the uterus. In *bona fide* cases, however, amenorrhœa being more of a symptom than a disease *per se*, the original cause should be diligently sought after and removed, if possible.

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When diagnosis between functional amenorrhœa and pregnancy is difficult, senecio may be safely prescribed before deciding, as it will probably cure the one, and certainly will do no harm to the other. Senecio will not cause abortion nor in any way influence the course of

pregnancy. W. E. Fothergill (Edinburgh Med. Jour., May, '98).

Emmenagogues may be classified into two classes,—medicinal and physiological.

Severe physical shock or fright sometimes causes the menstruation to return suddenly. Illustrative cases. Inglott (Brit. Med. Jour., Sept. 28, '89); Collins (Brit. Med. Jour., Oct. 26, '89).

When the arrest of menstruation is due to exposure to cold, warm baths and vaginal injections, sinapisms to the thighs and calves of the legs, saline laxatives and manganese-binoxide pills (2 grains each), one or two after each meal, are frequently successful. This drug acts by increasing the vascularity of the pelvic organs. The permanganate of potassium, or the lactate, in 1-grain doses three or four times daily, after meals, act in the same manner.

The following treatment is highly recommended in suppression of the menses:

℞ Liquor ferri et quinia citratis, 1 ounce.
Liquor potassii arsenitis, 3 drachms.
Strychnine,
Atropine, of each, ½ grain.
Elixir of orange-peel, enough to make 8 ounces.

M. Sig.: Teaspoonful in water, before meals, three times daily. The ingredients, or dose, to be increased according to the tolerance of the patient.

This is continued until there is manifested the peculiar menstrual discomfort, when it is discontinued and the following given:—

℞ Potassii permanganatis, 10 grains.

Divide into pills No. x, compressed or in capsule.

Sig.: One pill followed by one-half-glassful of water, before meals, three times daily.

Also:—

℞ Manganesium binoxide, 10 grains.

Divide into 10 compressed pills or into as many capsules.

Sig.: One pill after each meal, three times daily.

By the second or, at most, the third day after taking these the flow usually becomes fully established. If the manganese does not fully effect this at the first attempt, the first prescription is relied on during the interval, and the pills commenced about three days before the expected time.

In ordinary menstrual suppression the last two formulæ, used as above, are especially effective. De Wees (Med. and Surg. Reporter, June 30, '88).

In amenorrhœa, associated with mental diseases, the potassium permanganate is to be given in 1-grain pills three times daily, and after three months in 2-grain doses. The pills should be given for fully three months after the courses appear, and must be taken without intermission. Macdonald (London Practitioner, June, '88).

Of the manganese compounds the binoxide seems to give the best general results, though it cannot always be relied upon. The lactate is also an efficient and irritating agent. Segur (Med. Record, Feb. 2, '89).

When manganese binoxide pills are given they should be followed by a little water fifteen minutes later, in order to avoid the burning pain in the stomach, which they are liable to cause. E. J. Hauck (Va. Med. Monthly, Aug. 30, '91).

[The manganese binoxide or the lactate is particularly useful in cases of anæmia or in cases of temporary suppression. They are not abortifacient, are not injurious in medicinal doses, but are not an entirely efficient or reliable remedy. MUNDE and WELLS, Assoc. Eds., Annual, '89.]

In the amenorrhœa following sea-voyages the preparations of manganese and oxalic acid hold the first place.

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In amenorrhœa following a sea-voyage a valuable combination is peptonate of iron with manganese. Oxalic acid com-

bined with the iron and manganese in the following formula especially valuable:—

℞ Oxalic acid, 4 grains.
Peptonate of iron, 40 grains.
Peptonate of manganese, 160 grains.
Elixir of Curaçoa, 2 ounces.
Water, 6 ounces.

M. Sig.: A tablespoonful in a glass of milk three times a day.

This simple plan, with a well-regulated diet of eggs, fish, meats, oysters, milk, and vegetables that are rich in organic iron may be all that is required. H. C. Bloom (Univ. Med. Mag., Dec., '96).

When the manganese preparations fail, santonin, 10-grain doses at bedtime, is especially valuable in chlorotic subjects.

[Santonin, given in 10-grain doses at night, is a most reliable emmenagogue, particularly in chlorotic patients. Experience based upon a large number of cases. RINGER, Corr. Ed., Annual, '89.]

[We have seen it used with good effect. MUNDE and WELLS, Assoc. Eds., Annual, '89.]

The preparations of manganese and santonin may be given simultaneously,—1 grain of santonin at night and potassium permanganate in 1- to 2-grain doses thrice daily. Panecki (Amer. Jour. of the Med. Sciences, July, '94).

Senecio jacobæa is useful in functional amenorrhœa, as it not only anticipates the period, but increases the quantity. In many cases it relieves the accompanying pain and not infrequently the headaches from which some women suffer at such periods. The action of senecio jacobæa resembles that of potassium permanganate and is especially valuable in functional amenorrhœa. It causes the regularity and the copiousness of the flow. William Murrell (Brit. Med. Jour., Mar. 31, '94).

In stout chlorotics the amenorrhœa should be combated by tincture of senecio vulgaris, in 1- to 2-drachm doses three times daily. This drug tends to reduce the local pain and the headache. R. J. E. Young (Edinburgh Med. Jour., Sept., '94).

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Six cases. Blood-count in one case showed: red cells, 3,000,000; hæmoglobin, 52 per cent. Placed on ferratin, 8 grains four times daily, with aloetic purges, combined with perfect rest, and rose to: red cells, 4,600,000; hæmoglobin, 92 per cent.

The following combination is recommended:—

℞ Ferratin, 3 drachms.
Extr. of aloes, 14 grains.
Extr. rhei comp., 9 grains.

M. Sig.: Make into 30 tablets; take 1 or 2 tablets twice daily. C. E. Williams (Amer. Therapist, Aug., '97).

In amenorrhœa, following combination gives good results:—

℞ Myrrh,
Aloes,
Reduced iron, of each, 75 grains.
Extract of valerian, a sufficiency.

M. Divide into 120 pills, to be kept in powdered cinnamon. Dose, five pills three times a day. Oesterlen (Centralb. f. die gesammte Ther., Feb., '98).

The general system should be invigorated by attention to diet, sleep, and clothing. Out-of-door, light exercise and sunlight are most important. This is especially the case when there is rapidly increasing obesity. In the latter case the diet should be regulated, saline laxatives administered, or a cure at Marienbad recommended. Stimulation of the ovaries and uterus by the faradic current is especially efficient in these cases.

Cupping or scarifying the cervix is sometimes successful. These means increase the pelvic congestion and tend to counteract uterine or ovarian torpidity.

Rudimentary organs or atrophy of the uterus, if not too great, should be treated by dilatation of the uterus with tents and stimulated by the faradic current. Exercise and nourishing food should also

be given. Sea-bathing is of assistance in such cases.

The rheumatic diathesis occasionally plays a part as an etiological factor. In such cases the ammoniated tincture of guaiac, 1 drachm in milk three times a day, or the tincture of colchicum-root, 10 drops every three hours until the bowels become free, will sometimes restore arrested menstruation. The salicylate of sodium is also valuable in this connection. Apiol, 4 grains daily in 1-grain pills, for fifteen days, has given good results.

Apiolin is best combined with iron. Iron should be given uninterruptedly until a few days before the expected appearance of the menses. Then, continuing the iron, apiolin should be prescribed in 5-minim doses three times daily until the appearance of the menstrual flow. W. A. Newman Dorland (Amer. Therapist, July, '92).

Electricity is of great value, faradism, static electricity, galvanism, and galvanic intra-uterine pessaries being applicable according to the nature of the case.

Series of cases treated by negative intra-uterine electrization, with currents of 30 to 40 milliampères, for five minutes, the applications to be made about the time the menses are expected. These applications act by a complex action upon the uterus and ovaries, causing great congestion, and upon the nervous plexus presiding over the ovarian functions.

It should be reserved for cases in which amenorrhœa is only transitory, depending either upon some fault of vitality in the ovary (obesity, premature menopause, retarded menstruation in young girls near the age of puberty) or upon a lesion of the ovaries (chronic sclerocystic ovaritis) or of the uterus (chronic interstitial metritis, destruction of the mucous membrane by chloride of zinc; or by curetting, with or without Schröder's operation).

It is contra-indicated in cases of physiological amenorrhœa dependent on pregnancy, the menopause, or lactation.

It is useless in cases following a severe disease of which it is but a symptom or sequel (chloranæmia, morphinomania, tuberculosis).

It constitutes the most efficacious treatment known for amenorrhœa not dependent upon an organic irremediable cause. Nitot (Jour. de Méd., June 26, '92).

[We can only approve, in confirming it, of the author's conclusions. In rebellious cases the action of galvanic currents may sometimes be powerfully aided and completed by sinusoidal currents, which favor the flow of blood, either during the menstrual period or outside of it. Apostoli and Grand, Assoc. Eds., Annual, '93.]

Besides general treatment, percutaneous electrical application,—viz., spinal and combined spinal and abdominal applications of the galvanic current. In the former the anode is applied immovably over the lumbar region, while stabile application of the cathode is made over cervical and dorsal regions for the space of one minute, the dose being 10 to 15 milliampères; in the latter the anode is applied as before, and the cathode over each ovarian region, for fifteen to thirty minutes.

In case of retarded development the faradic current is used, the anode over the back and hypogastric region; the cathode, a well-insulated sound, is introduced into the uterus. The duration of the sitting is five to ten minutes, dose 5 to 25 milliampères. In some cases Apostoli's bipolar electrode is best used when an electrolytic action on the mucous membrane is sought for. In the majority of cases the ovaries must be included in the treatment by a cup-shaped electrode to cervix (cathode) while the anode is placed over each ovarian region; the dose is 10 to 60 milliampères for three minutes every third day. H. N. Hinton (Occidental Med. Times, '90).

Extract of cows' ovaries has been used with success, but further trials with this agent are required to establish its actual value.

Literature of '96-'97-'98.

Extract of ovaries found especially valuable in amenorrhœa attending chlorosis among a large number of cases in which it was tried. Muret (Revue Méd. de la Suisse Rom., July, '97).

Experiments with three fresh cow-ovary preparation (Merck's); the entire ovary, the canals, and a precipitate of the contents of the follicle-contents. The remedies were administered in form of tablet containing 4 grains each of the ovary preparation and common salt. The results obtained in eleven cases do not warrant any positive conclusion, although encouraging as to future trials. R. Mond (Münchener med. Woch., xliii, No. 14, '96).

The author has long used ovary extract and obtained good results in many cases of climacteric disturbances, amenorrhœa, and chlorosis. M. Muret (Schmidt's Jahrbücher, B. 252, H. 119, '96).

Pastilles containing about 7 grains of the dried substance of the ovary of swine or cattle, corresponding to about 45 grains of the dried substance, employed. Disturbances due to the natural or artificial menopause disappeared rapidly with the dose of from 2 to 6 pastilles daily. Amenorrhœa due to hypoplasia of the ovaries disappeared rapidly; hysterical manifestations were not modified by this treatment. F. Mainzer (L'Encéphale, June, '96; Revue des Sci. Méd. en France et à l'Etranger, Oct. 15, p. 556, '96).

Ovarian treatment, administered under the form of dried powder of the ovaries of heifers, in the dose of 4 or 5 grains daily, is not dangerous. In order to act it should be continued for some months; it is indicated in amenorrhœa, chloranæmia, artificial menopause due to removal of the genital organs, and accidents of the normal menopause. L. Touvenaint (Revue des Sci. Méd. en France et à l'Etranger, Jan. 15, '96).

E. E. MONTGOMERY,
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AMMONIA.—Ammonia is a transparent, colorless gas very acrid to the taste and giving a markedly alkaline reaction. It is made, in large quantities, from coal-gas, by heating the ammoniacal liquor with calcium hydrate, then conducting the gas through tubes containing charcoal. It may also be obtained by heating a mixture of dry slaked lime with chloride of ammonium. It evaporates with exceeding rapidity. It is very soluble in water.

Dose and Preparations.—The preparation used in medicine is a strong solution, or water of ammonia, the aqua ammoniæ fortior, U. S. P., which contains 28 per cent., by weight, of gas; it is used mainly as a vesicant. A weaker solution (hartshorn), the aqua ammoniæ, U. S. P., is more generally employed, and contains 10 per cent. of the gas by weight.

Liniment of ammonia: composed of water of ammonia, 30 parts; cottonseed-oil, 70 parts.

Camphorated liniment of ammonia: composed of water of ammonia, 30 parts; camphor-liniment, 70 parts.

Aromatic spirit of ammonia: composed of carbonate of ammonia, 40 parts; water of ammonia, 100 parts; oil of lemon, 12 parts; oil of lavender-flowers, 1 part; alcohol, 700 parts; water, enough to make 1000 parts. Dose, 30 to 60 minims.

Spirit of ammonia: an alcoholic, colorless solution containing 10 per cent., by weight, of the gas. Dose, 10 to 30 minims.

Fœtid spirit of ammonia: composed of 1 part of asafœtida to 21 parts of spirit of ammonia. Dose, ½ drachm.

Ointment of ammonia: composed of 17 parts of water of ammonia, 32 parts of lard, and 2 parts of oil of sweet almonds.

Physiological Action.—Ammonia is a most powerful irritant to the tissues; if

the exposure be long, local death and sloughing ensue. Inhaled it may also produce rapid death by œdema of the glottis or spasm. Moderate inhalations cause bronchitis, or at least tracheitis. Upon the nervous system it acts as a spinal excitant, increasing reflex action and spinal activity. Applied directly to a nerve, either motor or sensory, it paralyzes it; in very weak solution it seems to increase its functional activity. The circulation is increased to a great extent: the pulse-rate, pulse-force, and arterial pressure being due to stimulation of the accelerator nerves of the heart. The force of the action of the ventricles is much increased, and this, in turn, increases arterial pressure. In moderate amounts ammonia does not change the blood, but in poisonous quantities it causes it to cease absorbing oxygen. The rate of respiration is increased by stimulation of the respiratory centre; the respiratory movements become not only more full, but more rapid. Inhaled in small amounts, it causes the same action to a smaller degree. When large amounts are taken, ammonia is eliminated by the breath, is burnt up in the system, and is excreted in the urine.

Special research showing that the elimination of this gas by the lungs is doubtful. Paul Binet (Revue Méd. de la Suisse Rom., June 20, July 20, '93).

Ammonia exercises a depressing action on the liver, producing an increase in the amount of iron and a diminution in glycogen. T. Lauder Brunton and S. Delépine (Proceedings of the Royal Soc., No. 334, '94).

Ammonia Poisoning.—True poisonous effects are rarely observed, the intense caustic action of ammonia upon the mucous membranes of the mouth and throat causing the liquid to be coughed out almost immediately in the majority of instances. Spasm of the glottis and œdema may cause death. If the liquid is swallowed the mucous layer of the œsophagus becomes acutely inflamed, softened, and ulcerated, and stricture of the œsophagus usually follows.

Treatment of Ammonia Poisoning.—The antidotes are vinegar and lime-juice. Bland liquids—such as oil or milk—should be given, and stimulants—such as strong coffee—should be administered by rectal injection if the patient is unable to swallow. Hypodermic injections of ether or digitalis are valuable to sustain cardiac action if there is marked depression or shock.

Therapeutics.—Asphyxia, Collapse, and Shock.—In asphyxia, whatever be its origin, ammonia is a valuable agent, taken internally and simultaneously inhaled. During the latter procedure, however, care should be taken to not spill the liquid into the mouth or nose of the patient, which is likely to occur when he is in the recumbent position. Serious injury has followed accidents of this kind. In collapse and heart-failure, from 10 minims to a drachm of the water of ammonia, mixed with 6 drachms of sterilized water, may be injected into a vein.

Hypodermic injection of aromatic spirit of ammonia valuable in asphyxia and allied conditions. Case of uræmic convulsions following scarlet fever, in which respiration and pulsation had apparently ceased; the injection of 1 drachm above the cardiac region caused the patient to return to consciousness four consecutive times. Then used in other cases, including one of gas poisoning. The aromatic spirit of ammonia should always be diluted in order to prevent sloughing of the tissues in the vicinity of the injection. A. J. C. Saunier (St. Thomas's Hosp. Reports, London, June 1, '94).

In infants, the stage of collapse occurring in summer diarrhœa may also be

counteracted with a few drops of ammonia occasionally administered.

> In extreme stupor Fischer sometimes gives 3 drops of aromatic spirit of ammonia, with 10 drops of water. (Post-Graduate, Sept., '92.)

Gastric Hyperacidity.—In this condition, characterized by "heart-burn," acid eructations, and in fermentative processes following the ingestion of certain kinds of food, a few drops (3 to 5) of water of ammonia or 10 drops of the aromatic spirit in a little water frequently afford prompt relief. The fact noted by Sir Benjamin Ward Richardson that ammonia was antiseptic probably accounts, in a measure, for its effectiveness in arresting fermentative processes.

Alcoholism.—In acute alcoholic intoxication the various preparations of ammonia are considerably used. (See Alcoholism.) Lavage of the stomach followed by 10 drops of water of ammonia in a half-tumblerful of water, promptly counteracts the effects of intoxication.

Cholera.—For the algid stage, ammonia internally and ether hypodermically, besides the free administration of alcohol, have been highly recommended by Giacich, the aim being to support the failing heart. Marked improvement in the general condition was noted within two hours after the institution of this mode of treatment, and over 50 per cent. of those who had reached the algid stage are said to have been saved. Dumontpallier also recommends for the same purpose the hydrochlorate of ammonium. Besides the return of heat and perspiration caused by this salt, it increases diuresis, and therefore increases the elimination of the toxic elements of the disease.

Stings of Insects, Snake-bites, etc.—In lesions produced by venomous reptiles and insects, and carnivorous animals the antiseptic and corrosive effects of ammonia can be utilized to great advantage. The best plan in snake-bites is to apply it directly to the wound and to inject into a vein a solution of 30 to 60 minims in 6 drachms of water. The pure ammonia-water applied over the bites or stings of insects is effective; it reduces markedly the pruritus and pain.

Rheumatism.—The liniment sometimes quickly relieves mild forms of rheumatism and lumbago. When the skin is delicate, as it is in women, it acts as an active rubefacient.

AMMONIUM.—When an acid gas and ammonia-gas are brought together without liberation of hydrogen, a compound of ammonium is formed, which varies with the acid radicle forming the basis of the combination. We thus have formed the following salts:—

Ammonium arseniate, dose, $^1/_{60}$ to $^1/_{25}$ grain.

Ammonium benzoate, dose, 10 to 30 grains.

Ammonium bicarbonate, dose, 10 to 60 grains.

Ammonium borate, dose, 10 to 20 grains.

Ammonium bromide, dose, 10 to 60 grains.

Ammonium carbonate, dose, 2 to 10 grains.

Ammonium chloride, dose, 5 to 30 grains.

Ammonium fluoride, dose, $^1/_{100}$ to $^1/_{25}$ grain.

Ammonium formate, dose, 1 to 5 grains.

Ammonium iodide, dose, 3 to 5 grains.

Ammonium nitrate (employed in the manufactures).

Ammonium nitrite, dose 20 to 40 grains.

Ammonium phosphate, dose, 10 to 20 grains.

Ammonium picrate, dose, $^1/_2$ to 1 grain.

Ammonium salicylate, dose, 10 to 40 grains.

Ammonium sulphate (employed in the manufacture of aqua ammoniæ).

Ammonium sulphite, dose, 20 to 60 grains.

Ammonium valerianate, dose, 2 to 10 grains.

Physiological Action.—Some of the salts of ammonium stimulate the spinal cord and have no marked paralyzing influence upon the motor nerves, while others have no distinct stimulating action on the cord, and paralyze both it and the motor nerves. Many ammonium salts stimulate the vasomotor centres. These varied actions are mainly due to the acid radicle entering into the combination of the majority of ammonium salts. These, including the arseniate, the benzoate, the picrate, etc., will be treated under the headings including their acid radicle: Arsenic, Benzoic Acid, Picric Acid, etc. Others owe their properties mainly to the ammonium acting as base. The most important of these will be treated of in the following sections.

Ammonium Acetate.

The ammonium acetate is seldom used in its natural state; but it enters into the preparation of spirit of Mindererus (liquor ammonii acetatis), which, in turn, is extensively employed. This is prepared by saturating dilute acetic acid with ammonium carbonate. This forms a colorless liquid, which gives off a very faint odor of acetic acid. It has an unpleasant saline taste.

Dose.—The dose of spirit of Mindererus is 1 drachm to 2 tablespoonfuls, repeated every two or three hours.

Physiological Action.—Although the general use which this preparation enjoys indicates that it possesses some active virtues, all that can be said of it is that it is a weak stimulating diaphoretic possessing also diuretic properties. The latter it exerts without irritating the kidneys, increasing both the quantity of fluid and the excretion of solids.

In the light of our present knowledge, however, the properties just mentioned would seem to fulfill precisely the conditions desirable for the elimination of toxic products, in which process the skin and the kidneys play so prominent a part.

Therapeutics.—It is especially used at the outset of adynamic fevers and, in fact, should only be used during this period of any disease, before the stage of depression is near. Sweet spirit of nitre is generally preferred, owing to its more agreeable taste. It affords relief in some cases of dyspepsia as an antacid.

Ammonium Carbonate.

Ammonium carbonate is prepared by heating a mixture of ammonium chloride and calcium carbonate, then condensing the product. It occurs in white translucent masses, which, on exposure, become opaque and friable, owing to the fact that it parts with its ammonia and passes from a sesqui- into a bi- carbonate. It has a pungent odor, a sharp taste, and an acid reaction. It is soluble in four and a half times its weight of water.

Dose.—The dose of ammonium carbonate is from 5 to 10 grains, which should be repeated in two hours at the longest, the effect of the drug being evanescent.

Physiological Action.—Ammonium carbonate possesses to a smaller degree the stimulating properties of ammonia. It excites the functions of the skin, the kidneys, the bronchial glands, and the epithelium. It reduces the normal gas-

tric acidity and tends to irritate the stomach and cause vomiting if given in too large doses. It is thought to play an important rôle in the formation of urea and glycogen when penetrating the liver with a carbohydrate, the administration of food with ammonium salts being known to encourage the excretion of urea. Carbonate of ammonia also possesses antiseptic properties.

> A 5- to 8-per-cent. ammonium solution will preserve rabbit-fat ten months from decomposition. A 5-per-cent. solution of ammonium carbonate also acts as an antiseptic. Meat, animal organs, etc., kept in fumes of this drug, look nearly the same after six months. C. Gottbrecht (Archiv für exp. Path. und Pharm., B. 25, H. 5, 6, '90).

Therapeutics.—This drug is especially valuable in diseases of the respiratory tract. It acts as an active expectorant. In bronchitis, especially in the chronic form, when the dyspnœa is marked and the general adynamia is caused by interference with the functions of the pulmonary tract, it probably represents the best agent at our command. H. C. Wood regards it as the best preparation for continuous use in typhoid pneumonia. In both of the diseases mentioned it may be given in doses of from 5 to 10 grains, repeated every two hours, the effects of this dose upon the system lasting no longer than that time.

It is a valuable drug as a cardiac and nervous stimulant in the capillary bronchitis — broncho-pneumonia — of children.

In acute coryza it is also employed with satisfactory results.

> The best means of aborting an attack of acute coryza is the administration of rather large and frequently-repeated doses of carbonate of ammonia. Beverly Robinson (Boston Med. and Surg. Jour., Nov. 14, '89).

Ammonium Chloride.

Chloride of ammonium—or, as it used to be preferably called, muriate of ammonia, or "sal ammoniac"—is a white, translucent salt, having no odor, but a sharp, saline taste. It dissolves in three parts of cold and in one part of boiling water, and sublimes without decomposition at red heat.

Dose.—The usual dose is 5 to 10 grains, but when a sudden effect is to be produced, as in alcoholism, from 30 to 60 grains may be administered, with a copious draught of water.

Physiological Action.—Applied in its solid form or in saturated solution, ammonium chloride acts as an irritant upon mucous membranes. When given continuously for some time, it is thought to produce a profound impression upon the blood itself, lessening its plasticity and impairing its constitution; it may then cause prostration accompanied by the extravasation of blood under the skin, hæmaturia, and hæmorrhages from the mucous membranes. In smaller doses long continued, it tends to impoverish the blood, the latter containing less than the normal percentage of solids. It increases very notably all the solids of the urine, except the uric acid. It affects the mucous membranes, encouraging nutritive changes and the exfoliation of epithelium. Its chief elimination takes place through the kidneys.

Ammonium-Chloride Poisoning.—The experimental evidence published is contradictory, but it tends to show that this salt does not possess much toxic power even in large doses.

Gourinsky, after some experiments on frogs and pigeons poisoned with ammonium chloride, reached the following conclusions: In frogs whose spinal cord has been divided below the medulla oblongata, ammonium chloride produces

from the first a marked augmentation of reflex acts. In frogs deprived of certain parts of the central nervous system (spinal cord, medulla oblongata, the cerebellum alone being retained) this augmentation is preceded by a marked depression. In normal frogs and pigeons chloride of ammonium produces at first depression of the central nervous system, then convulsions,—that is, the higher centres exercise a great inhibitory influence on the spinal reflexes. When the poison is introduced rapidly the first stage (that of depression) is but slightly marked, and soon gives place to the second stage (that of irritation, ushered in by convulsions). When the poison is introduced slowly the general nervous depression is well marked and lasts a long time. In frogs and pigeons deprived of the cerebral hemispheres only, whatever be the method of introducing the poison, convulsions are not preceded by depression, but the latter is sometimes replaced by irritability. All the facts can be explained only by the reciprocal action of the nervous centres on each other, modified by the poison.

In a case in which a large quantity of ammonium hydrate had been taken the mucous membrane of the anterior part of the mouth was denuded, and the peculiar fact was noted that after three days, when solid nourishment was again taken, the food appeared to be saltless. P. Carles (Jour. de Méd. de Bordeaux, July 13, '90).

Therapeutics.—Ammonium chloride is especially valuable in all disorders in which the mucous membrane is involved.

Gastric Catarrh and Hepatic Torpor.—That ammonium chloride is valuable in catarrhal disorders of the stomach, especially in children, is sustained by the frequency with which it is still resorted to. It may be given in compressed pills, but a half-tumblerful of pure water should be taken simultaneously to prevent the irritating action of the salt itself upon the gastric mucous membrane. Milk may be used instead of water.

In all conditions characterized by torpidity of the liver, whether due to subacute hepatitis or general asthenia, chloride of ammonium is very valuable, in doses of 20 grains three times a day.

Ammonium chloride acts as a stimulant to the liver, causing at the same time a slight diminution in the amount of free iron in the organ. T. L. Brunton and S. Delépine (Proceedings of the Royal Soc., No. 334, '94).

In doses of 1¼ drachms per day it enhances the assimilation of fatty articles of food, increases the diuresis, and diminishes the body-weight. W. V. Malinine (Thèse de St. Petersbourg, '93).

In daily doses of 75 grains chloride of ammonium increases the assimilation of nitrogenous food and of nitrogenous waste. The elimination of improperly-oxidized products of neutral sulphur is augmented. It diminishes the number of the stools, but increases the absolute quantity of urine and the urinary salts. The reaction of the urine remains acid, but its specific gravity is diminished. V. S. Tchernycheff (Thèse de St. Petersbourg, '93).

Literature of '96-'97-'98.

Encouraging results from the use of ammonium chloride in dysentery. Sixty grains may be given every four hours; this rapidly decreases the amount of blood and the severity of the pain. J. W. S. Attygalle (Brit. Med. Jour., Jan. 29, '98).

Disorders of the Respiratory Tract.—Ammonium chloride has long been used as an effective remedy in almost every disorder of the respiratory tract. In recent years, however, the carbonate has replaced the chloride in the treatment of pulmonary disorders, but

the chloride is still considerably used in chronic bronchitis.

The fumes generated by the action of hydrochloric acid upon ammonia are considerably used as inhalents and are quite effective in mild chronic disorders.

Literature of '96-'97-'98.

Nascent ammonium chloride may be used to advantage in pneumonia. It may be generated by shaking together two cloths, the one wet with strong ammonia and the other with commercial hydrochloric acid. The nascent ammonium chloride is suspended like smoke in the room, and is inhaled by the patient. This substance is a germicide, the free ammonia is a tonic and stimulant to the lungs, and the acid supplies the deficiency of chloride. This method does not disturb the patient. T. Ashburton (Albany Med. Annals, No. 7, p. 360, '97).

The value of chloride-of-ammonium troches as a stimulant for pharyngeal disorders is well known. It serves the double purpose of increasing local lubrication by stimulating the acini, and of gently enhancing hepatic action. It may also be used in the form of spray.

Ammonium chloride in the form of a spray is valuable in the various catarrhs of the respiratory tract. Krakauer (Centralb. f. klin. Med., Oct. 15, '89).

Middle-Ear Disorders.—The use of chloride-of-ammonium vapor in affections of the middle ear has been prompted by its effectiveness in the treatment of catarrhal affections of the nasal mucous membrane, with which many aural disorders are intimately connected.

Chloride-of-ammonium vapor may be generated by attaching a Richardson continuous-spray apparatus, by the proximal end of the elastic ball to the distributing-tube of a Vereker chloride-of-ammonium inhaler, and a Eustachian catheter to the distributing-end of the spray-apparatus. A few squeezes must first be given to the ball so as to fill the apparatus with gas before introducing the catheter.

Again, if such a catheter, or even a glass tube drawn to a point, be affixed to a Higginson syringe, one of the best and handiest means of syringing the external ear will be afforded. The small and practically continuous jet, applied with any force desirable, almost immediately tunnels a hole in the hardest cerumen and quickly allows of that reflex current necessary for its removal, doing away with the need for clumsy ear-syringes. J. MacMunn (Brit. Med. Jour., Oct. 19, '95).

Cystitis.—In catarrhal inflammation of the bladder chloride of ammonium sometimes proves very effective, especially if taken with a tumblerful of water. Ten grains every four hours the first day and 5 grains the second day and thereafter soon cause the local distress to at least greatly diminish.

Ammonium chloride valuable in cystitis, primary or secondary. A capsule containing 5 grains of pulverized purified drug should be taken three or four times in twenty-four hours, preferably when the stomach is empty, and followed immediately by a half-gobletful or a gobletful of pure cold water. Faithfully tried in a large number of varied conditions with most satisfactory results. In the majority of cases the urine was rapidly cleared of mucus, blood-corpuscles, pus-corpuscles, urates, and phosphates, and the distressing symptoms speedily disappeared. Corrie (Virginia Med. Monthly, vol. xx, No. 6, '93).

Alcoholism.—In alcoholic intoxication the chloride of ammonium acts as effectively as ammonia. Its beneficial influence upon the liver renders it preferable to the latter. Thirty grains, repeated in thirty minutes, effectively brings the sufferer to his normal condition, as far as the mental aberration is concerned. This action will be continuous if an emetic or lavage of the

stomach have previously been resorted to.

In acute intoxication 30 grains of chloride of ammonium will generally sober for fifteen to twenty minutes persons helplessly drunk, so that they can walk steadily and speak soberly while the stimulating effect of the medicine lasts. J. Ringwood (Med. Press and Circular, Sept. 26, '88).

Literature of '96-'97-'98.

Case of delirium tremens in which 1 grain of morphine hypodermically did not produce the slightest effect. After the symptoms had all become aggravated, 1 drachm of chloride of ammonium given. This was promptly vomited. After a short time another drachm given, which was retained. In fifteen minutes the hallucinations—snakes, etc.—disappeared, and the patient became quite rational. In forty minutes he was asleep. Gilbert G. Cottam (Medicine, Nov., '96).

Case of a woman who had been intoxicated for eight days. She had "reptile" hallucinations, etc. Chloride of ammonium, ½ drachm in a large quantity of water, taken in two gulps. In fifteen minutes she was quieter; in fifteen minutes more the other half-drachm given. In a short time she was asleep. W. B. Gossett (N. Y. Med. Jour., Jan. 23, '97).

Neuralgia and Migraine.—In these disorders ammonium chloride frequently gives considerable relief, especially if given with tincture of aconite. Twenty grains of ammonium chloride with 2 minims of the tincture used every half-hour three times usually procures considerable diminution of the suffering.

Chloride of ammonium in supra-orbital neuralgia relieves the pain at once. It should be administered internally, and a small amount of it, finely powdered, be drawn into the nostril of the affected side. Chetan Shah Naug (Indian Med. Gaz., Apr., '88).

Good results obtained from doses of 20 grains in obstinate neuralgia. Green (Med. Press and Circular, Sept. 22, '88).

Wounds. — In the treatment of wounds its antiseptic qualities have been emphasized by H. C. Wyman, who obtained good results from an antiseptic gauze steeped in an ammonium-chloride solution, 1 ounce to ½ pint of water, especially in contused wounds. The circulation of the blood is increased in the parts which have been deprived of the wholesome influence of the blood-current.

AMYL-HYDRIDE. See Pentane.

AMYLENE is a derivative of fermentation of amyl-alcohol, which in the pure state has an oily character and an odor resembling that of old whisky. It appears in the form of a liquid with a specific gravity of 0.689 at 60° F. and a boiling-point of 95° F. It is soluble in water in the proportion of 1 part to 9319 parts, and is readily soluble in alcohol and in ether. It is said that water dissolves 2.35 per cent. of amylene-vapor, the water tasting of amylene for a long time. It has antiseptic properties, like nitrite of amyl, and prevents the putrefaction of blood. The odor evolved from a bottle that has contained blood and amylene resembles that of rosemary. The drug prevents decomposition of fresh flowers, but changes their color.

Physiological Action.—Amylene was at one time considerably used as an anæsthetic. It causes a slight excitement, a rapid inebriation, followed soon afterward by weak extremities, sudden collapse and coma, with total insensibility to pain, and, though rarely, with an equivalent loss of consciousness. Experiments on human beings have shown that the vapor of amylene, by inhalation, produces a state of anæsthesia in which acts of consciousness, previously conceived and carefully carried out, may be

performed, without remembering afterward any single fact connected with the action. This is a remarkable phenomenon, and seems to show that the human brain may exhibit objective consciousness apart from the subjective consciousness of life; in other words, a consciousness of which it is itself unconscious, and this under the mere influence of a volatile fluid which mixes so indifferently with blood at 98° F. that one part of it only will combine with a little over 10,000 parts of blood. This action of amylene and the phenomena of somnambulism seem to present a certain analogy.

Untoward Effects.—In sufficiently-large doses amylene produces death, and the only post-mortem change observed is engorgement of the right heart. No change in the color of the blood is produced; neither is there any alteration in the corpuscles or in the natural period of coagulation of the blood observed. It lessens muscular power, but this effect is not lasting. The fatal action of amylene is attributed not to any inherent powers of its own, but to the fact that when the drug finds access to the circulation it separates in the form of vapor, producing bubbles, and thus acts like air introduced into a vein.

Therapeutics. — The insensibility caused by amylene is quite complete, but exceedingly transient. After the drug is removed, recovery is rapid. Before complete insensibility is produced, three well-marked stages are observed: The first is one of mild excitement, during which the face becomes red and congested; the second is a period of staggering inebriety; and the third stage one of collapse and insensibility. A peculiar muscular tremor is frequently noticed. Locally, in the form of a spray, amylene acts as an efficient anæsthetic, being more rapid than anhydrous ether and more stable than amyl-hydride, which it closely resembles in its physiological action. (Benjamin Ward Richardson.)

AMYLENE-HYDRATE. — Amylene-hydrate, a tertiary amyl-alcohol, is a volatile, colorless liquid giving off an unpleasant peppermint-like odor. It is soluble in eight parts of water and is miscible with alcohol in almost all proportions. It was introduced by von Mehring as an hypnotic, and has since held a favorable position as such.

Dose.—For adults, the dose is 30 to 45 minims by the mouth, and 40 to 75 minims by the rectum. It should be kept in well-stoppered bottles. The disagreeable taste may be avoided by administering it in capsules.

The following formula has been recommended as efficient, while agreeable to the patient as well:—

℞ Amylene-hydrate, 1 drachm.
Water, 2 ounces.
Orange-flower water, 2 ounces.
Syrup of bitter orange, 1 ounce.—
M.

Of this mixture one-half may be taken at night. Amylene-hydrate leaves no bad taste in the mouth or disagreeable odor on the breath on awaking, such as are noticed after paraldehyde. The dose need not be increased, as a rule, even after repeated use.

Morphine may sometimes prove a valuable adjunct to amylene-hydrate when an analgesic effect is also required. The following formula has been recommended by Fischer:—

℞ Amylene-hydrate, 1½ drachms.
Morphine hydrochlorate, ¼ grain.
Distilled water, 3 ounces.
Extract of licorice, 2½ drachms.

M. Sig.: To be taken in two doses two hours apart.

If, owing to the nature of the case, it is necessary to administer the above agents by the rectum, the following may be used:—

℞ Amylene-hydrate, 1 drachm.
Morphine hydrochlorate, ¼ grain.
Mucilage of acacia, 5 drachms.
Water, 1½ ounces.—M.

Physiological Action.—Like alcohol, it first excites and then successively paralyzes all the nerve-centres. Toxic doses paralyze the cord and medulla, finally abolish reflex activity, arrest respiration, and paralyze the heart. The fatal doses were found to be 15 to 30 minims per kilogramme weight of animal. A very marked diminution of temperature is produced, intensifying the danger of life. Muscular spasms produced by poisons, such as santonin and picrotoxin, are delayed or alleviated. It cannot be employed subcutaneously, owing to the severe pain produced. (Harnack and Meyer.)

As an active antipyretic in warm-blooded animals it has also been credited by Harnack and Meyer with considerable power. The smaller the animal, the more marked the fall in temperature, which sometimes is as much as 11° C. (19.8° F.): from 38° to 27° C. (100.4° to 80.6° F.). This lowering is due to the direct action of the drug upon the thermic centres; at all events, the dilatation of the vessels is less pronounced than after the administration of chloral-hydrate. In man, however, amylene-hydrate does not influence the temperature to any degree, even in fever, and clinical observations are necessary to prove its value. It acts but feebly upon the respiration, heart, and vessels of warm-blooded animals; in man the sphygmograph shows some modifications in the pulse-cure. Experiments made upon the isolated frog's heart and the muscles in general show it to be a muscular poison; the muscles, at first excited, become paralyzed. It is regarded as an excellent antidote to all convulsants, especially when the convulsions are of cerebral origin (as in poisoning by santonin). Given internally, it diminished the elimination of urea; but, administered subcutaneously, it augmented its elimination. This latter phenomenon is due to its local irritating action (phlegmonous inflammation, abscess, or necrosis of the tissues).

The property possessed by amylene-hydrate of modifying secretions has been generally lost sight of, according to Brackmann, Scharschmidt alone having noted that some patients perspire at the beginning of its use. In the single instance in which it was used, a case of diabetes, an evening dose of 50 grains diminished the thirst, lessened the quantity from 230 to 100 ounces, and raised the specific gravity from 1005 to 1011 in six days. On the omission of the remedy the symptoms returned.

Amylene-hydrate Poisoning. — Untoward effects were noted by Dietz. In four instances a large overdose was given through neglect to shake the bottle in which the drug was mixed with syrup; deep sleep followed, from which the patients could not be aroused. There was total paralysis and suppression of tactile sensibility, including that of pain, and of corneal reflex. The pupils were dilated, and reacted but slowly to light. Respiration was retarded, superficial, and irregular; the pulse small, soft, and slow; the temperature lowered in two cases to 95° F. Artificial respiration was required in the case of one patient. During recovery there were confusion of ideas and inco-ordination of bodily movements. The author likens the toxic effect to that produced by alcohol.

He advises that to avoid such accidents the drug be administered in capsules.

Therapeutics.—Amyl-hydrate is justly considered by the majority of observers as an excellent hypnotic. It may be administered during long periods, owing to a quality not possessed by chloral,—*i.e.*, it does not tend to increase nitrogenous waste.

> Experiments showing that the action of amylene-hydrate is entirely opposite to that of chloral-hydrate, the latter increasing the quantity of nitrogen eliminated by the urine, the former lessening it about two grammes. That excreted by the fæces showed no change. Amylene-hydrate, therefore, prevents the destruction of albuminous substances, and it is preferable as a narcotic to chloral-hydrate whenever the hypnotic effects are to be continued for a long time, and in all affections in which there is an exaggerated decomposition of albuminoids; fever, more or less intense; very pronounced dyspnœa; anæmia and hectic diseases, especially pulmonary phthisis and diabetes; and also cases of digestive troubles with concomitant anorexia. J. Peiser (Fortschritte der Med., No. 1, '93).

It is especially in the insomnia of mental disorders that it has been employed. Headache sometimes follows its use.

It acts especially well in insomnia resulting from nervousness, excessive mental exertion, anæmia, fevers, cardiac diseases, insanity, and after the withdrawal of narcoties that have been constantly used. It is contra-indicated in insomnia from pain, cough, and frequently in cardiac and uræmic dyspnœa, and in gastric disorders attended with irritation or nausea, but in such cases its administration by the rectum is followed by the usual beneficial results. Many patients and children do not tolerate it on account of its taste and odor, but it is readily taken when administered in soft capsules. Unusual effects are produced only by large quantities, and consist in loss of reflexes, paralysis of extremities, mydriasis, low temperature, feeble pulse, and shallow respiration. No cases have been observed in which an amylene-hydrate habit was engendered, or a cachexia developed, due to the remedy. (W. H. Flint.)

To produce sleep in the above disorders it may be administered by the mouth or by enema with gum arabic and water. Unlike chloral, it has no irritative action on the mucous membrane of the rectum. Sleep comes on after fifteen to forty-five minutes, though often sooner, and occasionally no effect at all is produced. On the whole, it is a reliable hypnotic, if given in sufficient dose: two to three times as large as that of chloral, though it is somewhat less certain in its effects than is this substance or morphia. Unpleasant secondary effects, as excitement or slight drunken-like stupor, are very seldom witnessed. It does not lose its efficiency,—though given during three months in some cases,—and the deep and refreshing sleep is praised by the patient oftener than in the case of any other hypnotic. The drug is more powerful than paraldehyde or urethan, and is to be preferred to them. It should always be chosen in heart disease in place of chloral, though it is not so strong as the latter. It is fully equal to sulphonal, and, indeed, superior to it in many respects. Three capsules, each containing 15 minims are easily taken on retiring, and will almost certainly produce sleep. The effect follows much more promptly than after sulphonal, and it has not the same tendency to produce sleepiness and giddiness on the following day. (E. Kirby and J. P. C. Griffith.)

Epilepsy.—Evidence is not lacking to show that it is valueless and even dangerous in epilepsy. Umphenbach noticed from its use increased mental confusion and decided disturbance of sleep. Dunn experimented upon fourteen cases. He noticed from the drug at first an apparent transient improvement in some cases, though in others the number and severity of the attacks were increased from the beginning. A marked tendency to the development of *status epilepticus* manifested itself in some cases, while others sank into a state of coma, with subnormal temperature and slow, heavy respiration. The mental condition of patients under this treatment did not improve at all, even in those which appeared at first to be benefited in the number of attacks.

Insanity.—Amylene-hydrate has been thoroughly tried in cases of mental disorder. It is an hypnotic of a high order, occupying a position between paraldehyde and chloral. It is superior to the first in its less injurious action on the heart, and to the second in the absence of unpleasant odor on the breath.

In a large number of cases Lehmann obtained good results, though in mania large doses were required. Paralysis of the insane was benefited, but the insomnia of melancholy was aided to a less degree. Lehmann considers it more efficacious and less unpleasant than paraldehyde. It is quite effective in alcoholic delirium.

> In 149 observations 83 per cent. showed marked benefit, 15 to 75 minims being administered. Large doses were required in mania; the insomnia of melancholia was aided to a lesser degree than that of other disorders. It is more efficacious and less unpleasant than paraldehyde. Lehmann (Ther. Monat., Dec., '87).
>
> In 300 observations sleep came on between 15 and 45 minutes; occasionally no effect was produced. Although, as a rule, no unpleasant secondary effects were noted, 37 minims caused a condition resembling drunkenness in an hysterical woman. Avellis (Deutsche med. Woch., No. I, '88).

Opium Habit.—Sleep, lasting through the night with but little or no intermission, was obtained by Kirby and Griffith in a case of opium habit, in which chloral, bromides, paraldehyde, and hyoscine, given singly or variously combined, had produced but indifferent results. Like results have been noted by other observers.

Pulmonary Disorders.—In pulmonary disorders, G. Mayer found amylene-hydrate a reliable and pleasant hypnotic. It appeared not only to produce sleep, but to have a decided sedative influence on the cough. In phthisis it proved itself useful in this respect, after morphia had had but little effect. When there is pain or very troublesome cough, however, it is not so uniformly successful.

AMYLIFORM.—Amyliform is a true chemical combination of formaldehyde and starch. It occurs in the form of a white powder, without odor, insoluble in all liquids, and is very stable and not easily altered. It is gritty, or feels like sand when rubbed in the hands. In the body it is decomposed slowly into formic aldehyde and starch.

Therapeutics.—Formic aldehyde being a powerful bactericide, antifermentative, and antiputrefactive, amyliform proves useful in antiseptic surgery. Employed as a powder, it was found to diminish in a rapid manner the secretions upon sores, particularly those which have a bad odor. It is strongly antiseptic, deodorant, and absorbent.

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Employed both in major and minor surgery. No symptoms of intoxication or local irritation from its use, such as sometimes follows the use of iodoform, observed. Langaard (Therap. Monat., H. 10, '96).

Amyliform is absolutely free from irritating properties, and non-toxic. It favorably affects the secretion, prevents tissue necrosis, does not form a dry crust which retains secretion, and will absolutely prevent the foul odor from gangrenous wounds. Classen (Therap. Monat., Jan., '97).

AMYL-NITRITE. See NITRITES.

AMYLOID LIVER. See LIVER, DISEASES OF.

AMYL-VALERIANATE.—Amyl-valerianate, introduced by Blanc, represents the odoriferous principle of the apple,—that is, the essence extracted by distillation together with alcohol.

Dose.—Its toxic properties being very slight, as many as 5 or 6 capsules, containing 2 grains each, can be taken daily, but it is necessary to guard against gastric disturbance.

Physiological Action.—Cider has long been believed by the laity to have some effect on calculous formations, and this seems to be borne out by the fact that valerianate of amyl really has some solvent action on cholesterin. It is a colorless liquid, of pleasant taste when taken in small quantities, and can be prepared in the laboratory by the action of valerianic acid on amylic alcohol. Fifteen grains of cholesterin are dissolved by 70 grains of valerianate at 99° F., and by 46 grains at 104° F.

Therapeutics. — Physiologically, its action resembles that of ether, but the special qualities lie in its being a stimulant and sedative to the liver in cases of hepatic colic. It is said not only to immediately subdue the attack, but to prevent recurrences. If the stomach is irritable, it may be necessary first to employ sulphuric ether, following this with 2 or 3 capsules of 2 grains each, given every half-hour until the crisis is past, and continued at long intervals during the following days. According to Blanc, in nephritic colic the drug acts as an antispasmodic and general stimulant only, but no effect is produced on the renal calculi; muscular rheumatism is frequently relieved, and much benefit is also derived from its use during menstrual uterine contractions. It is also considered valuable as a sedative in hysterical manifestations.

ANARCOTINE. See OPIUM.

ANÆMIA.—From Gr., ἀ, priv., and αἷμα, blood.

Definition.—A symptomatic disorder of the blood characterized by a deficiency of some of its important constituents, especially red corpuscles.

Varieties.—Anæmia may be classified into two general forms: (1) that due to defective hæmolysis and (2) that due to defective hæmogenesis. Stephen Mackenzie recognizes four degrees of anæmia according to the number of red corpuscles present in the blood, but, with other observers, he regards the classification given by Hayem, in which the proportion of hæmoglobin in the corpuscles is taken as a standard, as more scientific. This is especially the case, since the number of red blood-corpuscles has not been considered as important a factor as it was once held to be.

Alterations of the blood in true anæmia are conformable to one of three types: (1) the anæmia from hæmorrhage, characterized by a diminution *in*

toto of all the elements of the blood: (2) a type characterized by hypohæmoglobinæmia,—*i.e.*, a deficiency of hæmoglobin, either quantitative or qualitative; (3) a type in which the number of red blood-corpuscles is reduced. Germain Sée (L'Union Méd., p. 145, '88).

Symptoms.—The main symptom of this condition is an abnormal pallor of the skin and mucous membranes, which varies in different cases from yellow to absolute whiteness. The finger-nails also show, by their whiteness, the general condition present. The pallor is associated with various phenomena indicating involvement of the nervous system. Marked depression of physical and mental powers is evident; there is tendency to inertia or indolence, especially during digestion. Inordinate palpitations are frequent, this condition causing, in the patients, a state of continuous fear as regards the presence of heart disease and anxiety concerning their general health. Shortness of breath on exertion, headache, and, in women, menstrual disturbances, amenorrhœa especially, and constipation, are also complained of. The surface of the body is cool and the extremities are usually cold. Sensitiveness to the variations of temperature is the rule.

The urine has a low specific gravity through deficiency of urea. The globes of the eyes may appear blue, owing to semitransparency of the conjunctiva.

Auscultation over the vessels of the neck reveals a venous hum; this symptom is often absent in mild cases, however. A systolic bellows-murmur is also frequently heard over the carotid arteries. A systolic murmur is occasionally heard over the aorta and the pulmonary artery. These are valuable guides when the effects of treatment are to be closely watched, their intensity varying with that of the degree of anæmia present.

Differential Diagnosis. — The symptomatic evidence is such, in the majority of cases, as to readily suggest the true nature of the disease. It is to be differentiated from the more severe forms: chlorosis, pernicious anæmia, leucocythæmia, and pseudoleucocythæmia.

Chlorosis.—The greenish pallor of this disease is quite characteristic. The reduction of hæmoglobin is disproportionate as compared to the number of red cells, which is not, as a rule, greatly reduced.

Pernicious Anæmia.—Examination of the blood is required to thoroughly establish the diagnosis, although the lemon-colored skin peculiar to these cases is quite distinctive.

Leucocythæmia.—The diagnosis is early established by the microscope, which shows the increase of white corpuscles, their ratio to the red corpuscles being sometimes 1 to 30 instead of 1 to 600, the normal proportion.

Pseudoleucocythæmia. — In this disease the presence of enlarged glands is characteristic.

Etiology.—The principal causes of benign anæmia are: (1) loss of blood, hæmorrhages; (2) improper assimilation of nutritive products or insufficiency of blood; (3) abnormal expenditure of blood-constituents, as in pregnancy and lactation. The first etiological factor is especially common in women, menorrhagia, metrorrhagia, and abnormal bleeding during labor being the most frequent causes. The second class affects the poor in the majority of instances, through lack of proper food, insufficient sunlight, and crowded quarters, to which exposure to a vitiated atmosphere the greater part of the time is added. The third class of cases, those due to pregnancy and lactation, are frequently met with, and explain, with the other causes,

the greater frequency of anæmia in women than in men. The latter, however, are more exposed to another class of causes, that due to introduction into the system of such toxic agents as lead, malaria, etc., which also tend to cause organic alterations of the blood-constituents.

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Rheumatoid anæmia corresponds to that seen in malaria—the probability being that it is the toxins circulating in the blood which by their solvent action on the hæmoglobin induce the deficiency, and not the destructive action of the bacilli themselves on the cells. G. A. Bannatyne (Lancet, Nov. 28, '98).

After removal of large collection of fluid, particularly of large collections in the abdominal cavity, the blood becomes thickened from transudation of serum into the cavity just emptied, so that the number of red cells may be increased. This serous anæmia is the cause of death in many cases which rapidly grow worse after repeated tapping. Gilbert and Garnier (Gaz. Hebdom. de Méd. et de Chir., Feb. 3, '98).

Pathology.—There may be a diminution of the quantity of the blood in the system, a deficiency of hæmoglobin, and reduction of the number of red corpuscles or of other constituents of the blood, all of which are to be determined by careful examination. The quantity of hæmoglobin is not always proportionate to the number of red corpuscles, the percentage of hæmoglobin in the latter being subject to variation according to the character of the disease present. In the benign form of anæmia treated of in this article, examination shows but a slight diminution of the number of red corpuscles and a relative reduction of hæmoglobin.

Treatment.—The treatment of benign anæmia may be summed up as follows: (1) on removal of the cause, if such be found; (2) on exercise of hygienic measures,—light, air, rest, and exercise; and (3) on proper medication. Of drugs, iron stands first, and is especially useful where hæmoglobin is greatly reduced. Next to iron is arsenic,—useful particularly where hæmoglobin is not so much reduced as the corpuscles.

Anæmia being in reality but a symptom, the causative affection must be carefully sought after. In women, as stated, uterine disorders are the most active factors. In young girls it is frequently met with, owing, probably, to temporary inequality in the development of various physiological functions. Hence the infrequency of complications in such cases. The possibility of complications should always be borne in mind, however, and every precaution taken to forestall aggravated forms, by food adjusted to the taste of the patient and made attractive to her. Disorders of digestion usually yield to bismuth and aromatic powder.

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The air of mountains by improving nutrition aids in the formation of hæmoglobin; more than this, by a mechanism still incompletely elucidated it determines the rapid formation of red blood-corpuscles. The hyperglobulia is not permanent in the case of healthy persons; if they descend to the lowlands the exaggerated number acquired in the mountains is lost in a few weeks. In anæmic persons the gain should be, all things being equal, more permanent; but even if it were purely transitory, a stimulation of the blood-making organs results, which should not be without effect. Lépine (Semaine Méd., Mar. 9, '98).

Breathlessness, palpitation, and muscular weakness, as well as many other similar symptoms due to anæmia, may often be much improved by instructing the patient in the proper manner of respiration. Deep respiratory movements have a marked effect upon the function of the liver, acting in the way of mass-

age of this organ. W. F. Somerville (Brit. Med. Jour., Oct. 1, '98).

As result of investigations into effect of exercise on hæmoglobin with reference to the value of rest in treatment of anæmia, it is concluded that (1) there is a normal daily fall and nightly rise in the worth of the corpuscle, representing a daily destruction and regeneration of hæmoglobin; (2) active exercise increases the extent of the daily fall and the nightly rise; (3) active exercise stimulates a slight overproduction of hæmoglobin; (4) passive exercise [massage] diminishes the volume of the blood, but has no effect in diminishing or increasing the amount of hæmoglobin; (5) rest reduces the extent of the daily fall in worth, representing a diminished destruction of hæmoglobin. Wilfrid Edgecombe (Brit. Med. Jour., June 25, '98).

Although iron is especially effective after the cause of the disease has been removed, even when the causative ailment is still present it exercises its beneficial effects, which are generally ascribed to the fact that iron is a normal constituent of the red corpuscles.

As regards the best preparation to be employed, it is difficult to make a selection. Theoretically, the best preparation, according to Herschell, is the nascent ferrous carbonate formed in the stomach itself by the reaction between sulphate of iron and carbonate of potash, while the worst preparations are the albuminates, peptonates, and colloid forms. In the latter, contact with the hydrochloric acid of the gastric juice produces a precipitate of insoluble ferric carbonate of iron. The alleged fact that these preparations are better borne in disease is evidently due to the fact that they are almost inert. In a comparative study of the subject, during which the hæmoglobin was estimated both before and after treatment by means of Fleischl's hæmometer, Herschell found Blaud's pills in tabloid form to be the most effective, having shown an average daily increase of 1.2 per cent. of hæmoglobin. Ferratin has also been recommended by many observers. Banholzer observed a 5-per-cent. increase of hæmoglobin in eight days. Whatever preparation is used, it should be changed for another after a few weeks and returned to, if its effects have manifested themselves actively. The remedy should invariably be administered after meals. Anæmic patients are usually imaginative and frequently assume that iron will not improve their condition. They must be assured that they will be benefited provided the instructions given them are carefully carried out.

Blaud's pills preferred to any other preparation of iron; next to iron comes arsenic. Arsenic acts with most effect in cases in which the relative percentage of hæmoglobin remains normal or is actually increased, the type of which is pernicious anæmia. Laache (Wiener klin. Woch., Sept. 18, '90).

Daily dose of ferratin for adults is 15 to 23 grains. Schmiedeberg (Arch. f. exp. Path. und Pharm., B. 23, H. 23, '94).

In anæmia following acute disease hæmoglobin quickly increased (over 5 per cent. in eight days), as also the number of red cells, by the use of ferratin. Banholzer (Centralb. f. klin. Med., Jan. 27, '94).

The double sulphate of iron and magnesium recommended in doses of 10 grains three times a day.

℞ Sulphate of iron and magnesium, 2 drachms.
Chloroform-water, enough to make 6 ounces.

M. Sig.: Half an ounce three times a day. Woods (Brit. Med. Jour., May 23, '91).

Iron exists in the blood only in the form of a phosphate. Soluble citrophosphate of iron, for the production of this salt, is not followed by constipation. Jolly (Provincial Med. Jour., May, '89).

Often more iron is administered than

can be properly assimilated. W. W. Jaggard (Ther. Gaz., June, '89).

Albuminate of iron is especially serviceable when anæmia and debility are associated with weak and irritable digestive organs. John A. Ouchterlony (Amer. Pract. and News, Nov. 23, '89).

Literature of '96-'97-'98.

In marked anæmia and chlorosis Blaud's pills in large doses recommended. As many as forty-eight on the fourth day have been given and continued for three or four weeks. It is necessary to keep the patient in bed in a large, airy room; hospital patients are more likely to recover quickly than private ones for this reason. Byrom Bramwell (Med. Record, Aug. 22, '97).

Some cases do not yield to the preparations of iron as long as constipation exists. Aperients may either be given separately or with the iron. Aloin and belladonna extract are useful in these cases.

Anæmia cannot be cured so long as the bowels are confined; regular evacuations are necessary. Hudson (Med. Press and Circular, May, '88).

Literature of '96-'97-'98.

Iron and rhubarb may be combined as follows:—

℞ Protoxalate of iron,
Powdered rhubarb, of each, 1 grain.

Make into a cachet. Give two or three of these cachets each day. Editorial (Jour. des Praticiens, Mar. 28, '96).

Iron may be administered hypodermically. This method is of great value when the anæmia is far advanced and a sudden reaction becomes necessary.

Literature of '96-'97-'98.

Case of grave anæmia in which prolonged treatment with many preparations of iron and arsenic taken internally produced no effect. The hæmoglobin sank below a sixth of its normal amount. The patient apparently dying, subcutaneous injections of a 4-per-cent. solution of citrate of iron tried, 45 to 60 minims being injected daily. Marked improvement took place almost at once, and the percentage of hæmoglobin rapidly rose. In a month's time the patient was convalescent.

A 4-per-cent. solution is quite strong enough. The 10-per-cent. solution generally employed is too strong. Hypodermic injections of 3 grains of citrate of iron have been known to cause vomiting and fever. The kidney is liable to be damaged by too concentrated solutions, leading to anuria and hæmaturia and even nephritis. Hypodermic injections of iron are not indicated in cases where the kidneys are not sound. R. Lépine (La Semaine Méd., May 26, '97).

The subcutaneous injections of iron salts in the form of a 10-per-cent. solution of iron and ammonium citrate, 1 grain and upward of the drug being given in each injection, tried. In every instance in which the injections were continued sufficiently long, the percentage of hæmoglobin regularly increased, and simultaneously the phenomena of anæmia, both subjective and objective, decreased. This shows that the anæmic condition can be markedly benefited by iron when given subcutaneously. Riva-Rocci (Il Policlinico, No. 8, p. 168, '96).

While iron is the most active of the chalybeates, other drugs tend to increase blood-formation, — namely, manganese, phosphorus, arsenic, hydrochloric acid (indirectly), and oxygen. Manganese sometimes proves useful when amenorrhœa is present. Phosphorus and arsenic encourage nutrition and probably act as germicides, preventing ptomaine formation in the intestines.

Waters containing small quantities of iron give better and quicker results than pharmaceutical preparations, and all the unfavorable symptoms so often produced by the latter are avoided. Th. Bernard (Gaz. Méd. de Paris, Apr. 8, '93).

Literature of '96-'97-'98.

Iron increases in a marked degree oxidation, while arsenic, on the contrary, exerts a powerful moderating influence on this process. The indications for one of these drugs are consequently exactly the opposite of those of the other. Treatment by iron is called for in cases of anæmia with reduced co-efficient of oxidation, whereas arsenic should be ordered when the oxidation is increased. A. Robin (Med. Week., Apr. 2, '97).

Failures in the use of iron are frequently met with in anæmia and chlorosis. These appear to be dependent upon the absolute loss of appetite. The restoration of the appetite is brought about by phosphorus, and then sufficient iron can be absorbed in the form of the ordinary medicinal preparations or in the foods which contain iron, as meat, eggs, lentils, and red wine. The best method of administering the remedy is as the phosphorated oil in gelatin capsule, each containing $^1/_{64}$ grain of the drug. The treatment is begun by giving one capsule each day, and every second day increasing by one capsule until five are taken each day. Then the dose is diminished in the same way until the initial dose of one capsule is reached. If the appetite is not permanently benefited after ten days, the treatment is repeated. Casati (Gaz. degli Osp., No. 4, p. 37, '97).

Case of a girl of 20 who had tried all remedies recommended in anæmia, but without effect. Nettle-soup ordered first, every second day; then, when she improved, twice a week. Patient was completely cured. The author himself was cured of anæmia, when he was 17, by taking nettle-soup. The common or stinging nettle (*Urtica dioica*) and the dwarf nettle (*Urtica urans*) possess the same virtues, but the first is used almost exclusively. The best time for collection is spring; the best part to use is the roots and stalks with only half-developed leaves. It may be used as an infusion—a handful to two quarts of water, 2 or 3 glasses of this to be taken during the day; but it is much pleasanter to use in the form of a freshly-prepared soup from the fresh herb. Hjalman Agnér (Bull. Gén. de Thér., June 8, '98).

Hæmoglobin continued until the normal standard is reached—1½ grains daily—has met with favor. If there is no digestive trouble, other preparations of iron can be given at the same time, and the results be more prompt.

Hæmogallol, the dose of which is 1 grain, given a quarter of an hour before meals gradually increased to 1½ grains and over, has been recommended by T. Lang and others.

A number of agents have been recommended with the view to lessen the destruction of blood-corpuscles; arsenic, quinine, mercury, phosphorus, beta-naphthol, iodoform, carbolic acid, sulphocarbolate, and menthol represent this series. Arsenic probably accomplishes this in the manner indicated,—namely, by preventing the formation of ptomaines.

Direct transfusion of blood is also of value in cases of chronic progressive anæmia, by stimulating the blood-making organs. This measure is sustained by von Ziemssen.

The introduction of goat's serum directly into the veins, using about 50 cubic centimetres ($1^3/_4$ ounces) has been advocated by Lépine.

Striking curative results have been obtained by Simon Baruch, by means of hot-air baths in boxes, followed by cold douches.

Literature of '96-'97-'98.

Hot baths in more than fifty cases of anæmia in patients who for the most part had been under medical treatment without benefit. A bath at 104° F. is given three times a week. Its duration should not exceed fifteen minutes, and at its close the patient should be douched with cool water. Immediate effect of such a bath is a feeling of lightness in

the individual, and in four weeks' or a less time there is a noticeable improvement in the general condition. Rosin (Centralb. f. innere Med., Apr. 30, '98).

Hayem in 1889 recommended the hypodermic injection of arsenical preparations in cases where irritability of the stomach prevented its administration by the mouth. The best means of administering Fowler's solution is in cherry-laurel water, in 10-drop doses, as much as 20 drops being sometimes given in a day.

Literature of '96-'97-'98.

Report of thirty-five cases of severe anæmia due to various causes—such as pernicious anæmia; anæmia after typhoid fever, round ulcer, cancer, tuberculosis; and that due to tape-worm—in which a solution composed of 2 parts of water and 1 part of Fowler's solution was employed. Of this mixture, an ordinary hypodermic syringeful was given daily. In all instances a marked improvement in the anæmia noted. Kering (Jour. des Praticiens, Jan. 18, '96).

Oxygen does not possess the confidence of the profession, although some rather remarkable cases have been reported.

[Nothing is to be expected from oxygen, for the blood-corpuscles, few in number though they be, are well charged with hæmoglobin and consequently with oxygen. In chlorosis the case is different. F. P. Henry, Assoc. Ed., Annual, '89.]

The quantity of oxygen should be governed by the exigencies of the individual case; for instance, in chronic disorders associated with anæmia, 2 to 4 gallons three times a day are required. Valenquela (Med. Review, Aug. 1, '92).

Nascent ozone inhaled from a Labbi and Oudin apparatus gives prompt results. Augustus Caillé (Boston Med. and Surg. Jour., May 12, '92).

Literature of '96-'97-'98.

In marked anæmia and chlorosis the inhalation of oxygen has been tried, but without much benefit. F. Taylor (Med. Record, Aug. 22, '97).

Insomnia is a frequent accompaniment of anæmia and tends greatly to increase the weakness of the patient. Amylene-hydrate is the best agent in this condition, 30 to 45 minims being administered in capsules on retiring.

In insomnia of anæmia, amylene-hydrate. For adults the dose is 30 to 45 minims by the mouth, or 40 to 75 minims by the rectum. It should be administered by the mouth in soft capsules, or in a solution disguised by some aromatics. The mixture should be well shaken before use, to avoid an overdose. W. H. Flint (Ther. Gaz., Jan., '90).

Submammary infusions of salt solution in primary anæmia from hæmorrhage, in shock, were recommended recently by J. G. Clark. As a stimulant after severe blood-loss or shock, its benefits are so marked, and the procedure so free from bad results of any kind, that it has been used with signal success by Howard Kelly, of Baltimore, in forty-one of the last 225 cases of abdominal section in the Johns Hopkins Hospital.

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A quart of 0.6 sterilized solution of common salt is used, and is infused into the submammary cellular tissue in the following manner: A bottle containing the solution is connected by five feet of rubber tubing to a slender aspirating-needle. The breast, after being carefully disinfected, is grasped and lifted well from the thorax, while the needle, with the fluid flowing from it, is quickly thrust beneath the gland. Usually simple elevation of the bottle is sufficient to force the fluid into the loose cellular tissue; if this be insufficient, stripping the tube or the reversed aspirator pump can be used. The breast rapidly distends, and in some instances the fluid may actually spurt from the nipple. After a quart has been injected,

the needle is rapidly withdrawn and the puncture closed with adhesive plaster. In thirty minutes complete absorption has taken place. Manifest improvement in the patient's condition is rapidly apparent, especially with regard to pulse, which shows greater volume and strength, while the patient herself feels better and is brighter. A critical stage occasionally occurs in some cases within half an hour. This consists in a violent chill, with sensations of extreme cold, rise in temperature, and strong, rapid pulse; but this is followed by a marked reaction. From its safety this procedure is strongly to be recommended instead of arterial or venous infusion. J. G. Clark (Amer. Jour. Obst., June, '97).

Bone-marrow has recently been extensively used in anæmia, with varying results. This subject is reviewed under Animal Extracts.

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Fourteen cases of anæmia in tuberculous joint diseases and in osteomalacia treated by the administration of a preparation of red bone-marrow and bullock's blood, called "carnogen." The substance was given in 2-drachm doses twice daily, the improvement in the condition of the patients as rapid as it was marked and sustained. This method appears to be of especial use in cases where arsenic, iron, strychnia, and codliver-oil had been exhibited without benefit. C. H. Jaeger (N. Y. Med. Jour., July 31, '97).

ANÆMIA, PERNICIOUS.

Definition.—A form of anæmia which tends toward a fatal issue.

Symptoms.—The most evident symptom is extreme pallor of the face and body, which gradually assume a lemon-yellow tint. This yellowish color deepens as the case progresses; it may appear suddenly, but in the majority of cases it develops gradually, following the insidious course of the disease.

There is great weakness with all its attending symptoms,—inordinate palpitations and dyspnœa on exertion, sighing, and slow delivery in speaking.

The pulse is regular, but rapid, in the majority of cases, more or less fever being usually present. The temperature is extremely irregular.

Cardiac murmurs are generally heard, and signs of fatty degeneration may be detected by auscultation, although there is usually no arterial degeneration or valvular disease. A loud venous hum can sometimes be detected in the vessels of the neck. Œdema of the ankles, face, and lungs and dropsical effusions may appear at any stage.

Retinal hæmorrhage is a symptom of great value. There may also be hæmorrhages into the mucous membranes, epistaxis, menorrhagia, and purpuric eruptions in advanced cases.

Gastric and intestinal disorders are the rule, although the general nutrition is apparently preserved, the appetite being sometimes voracious and the patient becoming obese. Dyspepsia, vomiting, and diarrhœa usually prevail. The gastric region is tender to pressure, and the tongue is pale and smooth.

Involvement of the osseous system is occasionally indicated by sensitiveness of the bones, especially those of the sternum.

Drowsiness is present in the majority of cases, but insomnia is occasionally observed.

Headache, vertigo, tinnitus, apoplectiform attacks, delirium, and other disorders of the nervous system, such as paræsthesia, neuralgia, and extensive paralyses, have been noted.

Absence of the knee-jerk is often present, and is indicative of degeneration of the posterior columns of the cord.

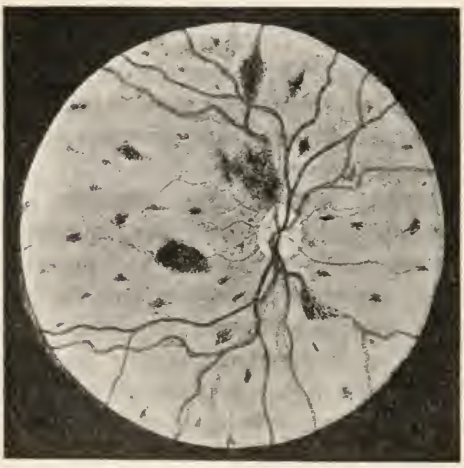
Jaundice is occasionally met with.

The urine is dark and highly colored;

it is of low specific gravity, and shows an increase of urea and uric acid and pathological urobilin.

When the end is approaching the temperature recedes markedly, and the patient enters into a torpid condition, ending in coma.

Diagnosis.—While pernicious anæmia possesses characteristics that readily distinguish it from other blood affections, —the color of the skin, the retinal hæmorrhages, etc.,—the early stages are generally such as to suggest diseases



Fundus oculi in a case of pernicious anæmia, showing retinal hæmorrhages. (*Bramwell.*)

that do not present the same degree of danger.

Benign Anæmia.—Intractability of the disease, after the removal of supposed causes and the faithful use of appropriate measures of treatment, strongly suggests the presence of pernicious anæmia.

Chlorosis.—From this affection pernicious anæmia may readily be differentiated by the blood examination. Instead of relative increase of hæmoglobin, the presence of gigantoblasts, marked oligocythæmia, and macrocytes differentiate. The red corpuscles, in chlorosis, may be normal in number and in size, the only change being a deficiency of hæmoglobin. Again, the corpuscles may be normal in number, but diminished in size, while the percentage of hæmoglobin is normal; finally the corpuscles may be diminished in number with either a diminished, normal, or perhaps an increased percentage of hæmoglobin.

Leucocythæmia.—This disease may be excluded by the absence of the characteristic blood-change: excess of white corpuscles.

Pseudoleucocythæmia is excluded by the absence of the affection of the lymphatic glands which characterizes this disease, more commonly known as Hodgkin's disease.

Leukæmia.—In leukæmia the patient often does not show enough pallor to make the physician suspect the disease. The lips have a dirty-red color rather than a peculiar pallor. The number of white corpuscles would cause pallor in a patient with simple anæmia, but in this disease the opacity of the blood is great and the pallor fails to show. (Janeway.)

Gastric Cancer.—This condition almost always shows itself after the age of forty years, whereas pernicious anæmia is generally observed early in life. In cancer the skin is pale; in pernicious anæmia the peculiar lemon color is striking in the majority of cases. While gastric symptoms and absence of hydrochloric acid are prominent features of cancer, the digestive disorder is slightly marked in anæmia and examination of the gastric contents is negative. Finally increasing emaciation attends a cancerous disorder, whereas in cases of pernicious anæmia the patient not only retains his adipose tissues, but some-

times becomes corpulent. In rare cases, however, there was extreme emaciation.

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Attention drawn to the impossibility of marking off pernicious anæmia from all other anæmias. There is no marked boundary-line; one anæmia passes insensibly into another. T. G. Stewart (Clinical Journal, Sept. 14, '98).

The difference between the pernicious anæmia and other grave anæmias lies in the clinical course, that of the former being characterized by the fact that even after the removal of the apparent cause, the hæmapoiesis persists in a faulty direction, manifested by insufficient new formation and perhaps increased destruction of corpuscles. There is in this disease then a morbid cell-activity that tends to persist with great pertinacity in the wrong direction. E. Grawitz (Berl. klin. Woch., Aug. 8, '98).

Etiology.—Although the disease occasionally occurs in children, it is most common in adults between the ages of twenty and forty years.

Males are attacked more frequently than females, with a slight difference in favor of the former. The disease is more prevalent among the better than in the lower classes, and is most common in Europe, especially in Switzerland,—*e.g.*, in regions in which the people are badly fed, and who live in poorly-ventilated and badly-lighted houses. Fright and grief are prominent etiological factors.

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Two cases of pernicious anæmia secondary to, if not due to, nervous influence,—anxiety and grief,—followed by digestive disturbances. They would seem to indicate nervous shock bringing on gastro-intestinal disorders, with malnutrition and anæmia. This view is also in accord with the studies of the pathology of pernicious anæmia by Hunter and others, tending to show that it is related to, and is largely secondary to, conditions of the gastro-intestinal tract. The poisonous agent probably escapes the liver, is not destroyed as it should be, but enters and acts directly upon the blood, producing anæmia. J. H. Musser (Alienist and Neurologist, July, '96).

While nervous shock or disease of the nervous system is not recognized in many of our text-books as an important etiological factor in pernicious anæmia, a number of cases are reported in which this is the assigned cause:—

Case of an author who, after a most severe mental strain, succumbed to a fatal anæmia. (Eichhorst.)

Case of a woman, 38 years of age, who was unexpectedly brought face to face with the body of her suicidal brother with his throat cut. From that time health began to fail, and in four years and two months she was dead of a grave anæmia. (Curtin.)

Young woman suddenly informed of her brother's death. Nervous prostration, pernicious anæmia, and death. (No author mentioned.)

Woman, aged 42, after an attempt at her life by her husband. (Musser.)

Case of a young woman, who accidentally poisoned her father; overwhelmed by grief, she took to bed and died of acute anæmia. (Marsh.)

Case of a young man who saw a child run over in the street; greatly shocked; fatal acute anæmia. (Marsh.)

Case of a young man who died of acute anæmia after he had been attacked by a sheep. (Sir William Gull.)

Cases also reported by Osler and Pepper. J. B. Herrick (Alienist and Neurologist, July, '96).

The following group of etiological factors has been established in pernicious anæmias: 1. Gastro-intestinal disease of long standing, poor food, impaired digestion; chronic constipation, especially in women frequently pregnant; irregular defecation in women and girls, especially those of hysterical temperament. In such cases it is due to intoxication from the gastro-intestinal tract. 2. Pregnancy. Here, too, probably, there is an autointoxication from the intestinal tract, on account of pressure exerted by the gravid uterus on the bowel. 3. Chronic hæmorrhages, especially of small

size. 4. Constitutional syphilis, particularly when associated with sclerosis of the marrow of the long bones. 5. Bad hygienic conditions of various kinds, especially in the female sex; hard work, with insufficient food, bad air, and emotional excitement. In higher social strata the disease may be found in women who are subjected to intense mental strain as the result of a desire to equal men in physical efforts. Frequent pregnancy and prolonged lactation are also factors. 6. Chronic poisoning, as, *e.g.*, by carbon monoxide. 7. Bothriocephalus and anchylostomum — those cases belong here that are not cured after the expulsion of the worms. E. Grawitz (Berl. klin. Woch., Aug. 8, '98).

Pregnant women represent the largest proportion of cases. Repeated parturition is probably the most prolific cause of the disease, for it is seldom met with in primiparæ. Excessive and prolonged lactation and puerperal hæmorrhages and other exhausting conditions frequently appear as the primary element in the causation of the disease.

Certain atrophic conditions of the gastric mucous membrane, ulcers of the stomach, malaria, syphilis, cancer, and alcoholism have also been considered as etiological factors.

Infection through solutions of continuity or purulent foci may possibly act as a primary cause.

Case in which the symptoms of pernicious anæmia followed a wound of the heel; probably the result of septicæmia. Fischel and Adler (Brit. Med. Jour., Dec. 30, '93).

Fatal case, in the right lung of which, at the apex, was found a dense "mycotic infiltration," suggesting that poisoning of the blood resulted from the entrance of micro-organisms into the system. Case had shown retinal hæmorrhages and other typical signs of pernicious anæmia. McCall Anderson (Glasgow Med. Jour., Feb., '93).

Staphylococci found in the blood of a case during life. Feletti (La Semaine Méd., Oct. 30, '95).

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Case of pernicious anæmia, in a child of 7 years, running a rapidly fatal course,—less than three months. Probability of the disease being of septic origin; the child had long-standing middle-ear mischief. Advanced fatty degenerative changes found in the liver and heart. Mercer (Brit. Med. Jour., May 1, '97).

Intestinal parasites—the anchylostoma duodenale and the bothriocephalus latus—are also considered as possible etiological factors.

Three cases of profound anæmia with retinal hæmorrhages, associated with tape-worm. A. Natanson (St. Petersburger med. Woch., Aug. 11, '94).

Five cases of invasion by bothriocephalus latus, each presenting the character of pernicious anæmia. Dehio (St. Petersburger med. Woch., Jan. 5, '91).

Sixty-seven heads of bothriocephalus voided in one case of pernicious anæmia, after powerful vermifuge. Askanazy (Zeitschrift für klin. Med., B. 23, H. 5, 6).

In twenty-six fatal cases in Fiji eighteen found to have anchylostoma in duodenum. Hirsch (London Lancet, Dec. 1, '94).

Changes in most respects identical with those of classical pernicious anæmia. C. W. Daniels (London Lancet, Jan. 5, '95).

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Of twenty-three native African negroes, representing various parts of East and West Africa, the following parasites were found: Anchy ostoma duodenale, twenty-one times; trichocephalus dispar, eight times; ascaris, eight times; anguillula stercoralis, four times; tæniæ, four times; amœbæ, twice. *The negroes showed no sign of anæmia,*—so striking a symptom in Europeans with anchylostomiasis. Zinn and Jacoby (Berliner klin. Woch., No. 36, '96).

Pathology.—The two prevailing the-

ories as to the pathogenesis of pernicious anæmia are the following: 1. That the disease is due to breaking up of the blood-corpuscles (hæmolysis). 2. That, owing to some defect in the blood-making (hæmogenesis), the blood becomes vulnerable to the destructive influence of micro-organisms.

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Blood-destruction always plays a part in the pathogenesis of pernicious anæmia, but evidence shows disease of the normal hæmogenetic tissues, in spite of compensatory activity of the medulla of the long bones, without increase of the normal hæmolytic processes, can also produce the same group of symptoms. Pernicious anæmia may be due to increased hæmolysis caused by toxins absorbed from the digestive tract or elsewhere, or to excessive fragility of new-made red corpuscles with normal hæmolysis. W. B. Ransom (Brit. Med. Jour., Jan. 8, '98).

Deficiency of red corpuscles (oligocythæmia) is always very great; the blood is, therefore, pale and thin, resembling sherry-wine. The oligocythæmia is sometimes so marked that the normal proportion of 5,000,000 red corpuscles to the cubic millimetre is reduced to one-twenty-fifth of that number. Quincke reported a case in which there were only 143,000 to the cubic millimetre immediately before death.

The hæmoglobin is also greatly reduced (oligochromæmia), but not in proportion with the cell-reduction. The hæmoglobin percentage was greater by 10 per cent. in a case seen by Osler.

Red cells deprived of their hæmoglobin refuse to stain; these bodies in pernicious anæmia are robbed of their coloring-matter. W. R. Graves (Medical Press and Circular, May 8, '89).

Müller's fluid, used by Graves, deprives the cells of their coloring-matter. While there is no doubt that an extensive destruction of red corpuscles occurs, this destruction is the consequence of the formation of an imperfect blood. Earl and Purser (Dublin Jour. of Med. Science, May 1, '89).

[Evidence of excessive hæmolysis is undoubtedly found in pernicious anæmia, but is by no means limited to that affection. F. P. Henry, Assoc. Ed., Annual, '90.]

Besides the above, there is a species of degeneration closely resembling coagulation necrosis, and an alteration of the corpuscles, characterized by the appearance in their interior of one or two corpuscles composed of modified hæmoglobin,—*dégénération hémoglobinémique.* The process of regeneration is manifested by the presence of nucleated red corpuscles, which are divided by Ehrlich into two varieties,—the normoblasts and the megaloblasts, the former corresponding to the hæmatinic evolution of adults, the latter to that of the embryo. The nucleus of the normoblast is extruded to form a new red corpuscle, while the nucleus of the megaloblast is absorbed.

Fresh blood shows nucleated red corpuscles of large size, divided by Ehrlich into megalocytes and gigantocytes. Others are termed macrocytes.

Fürbringer has shown that a case is to be considered as one of true pernicious anæmia only when one-fourth of the red corpuscles are macrocytes.

So long as the nucleated corpuscles do not exceed the size of a normal red globule, and especially if their nuclei are readily stained, the process is to be regarded as one of conservative blood-degeneration. Neusser (Wiener med. Presse, Mar. 29, '90).

In the severest forms of secondary anæmia these nucleated cells are either entirely absent or very scarce. Leyden (Berliner klin. Woch., Mar. 10, '90).

Case in which they were very numerous, as many as six or eight appearing in each microscopical field. Israel (Berliner klin. Woch., Mar. 10, '90).

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In pernicious anæmia the descendants of the metrocytes have lost their karyolytic properties; the nuclei increase in size, instead of being expelled from the cells; the protoplasm also grows larger, and the resulting size and character of the cells found in the red marrow closely resembles the embryonic metrocytes.

The presence of megaloblasts is a sign that certain pathological changes are taking place in the red marrow rather than a distinctive feature of pernicious anæmia. The macrocytes and metrocytes are more characteristic of pernicious anæmia, because they are the direct precursors of the large red marrow-cells. Engel (Wien. med. Woch., No. 20, '98).

Misshapen corpuscles (poikilocytes) are very frequently observed, oftener, indeed, than in any other affection.

Many small, imperfectly-developed corpuscles (microcytes) are generally found.

In marked cases corpuscles endowed with motion are occasionally observed.

Red blood-corpuscles of normal blood are motionless. The elements observed in cases of high degree of anæmia are endowed with four kinds of motion: 1. A movement of the entire mass of the corpuscle. 2. The projection of mobile prolongations. 3. A movement of oscillation, manifested solely by minute corpuscles. 4. A movement which results in changing the position of the corpuscles. These movable corpuscles are bodies arrested in their evolution and still retaining the contractile properties of the hæmatoblasts from which the red corpuscles originate. On superficial examination they might readily be mistaken for parasites. Hayem (La Médecine Moderne, Feb. 26, '90).

Phenomena described by Hayem observed in several cases. Corpuscular movements can be observed in the blood at the ordinary temperature, under a power of 600,—a species of Brownian movement due to altered adhesion relations. Browicz (Deutsche med. Zeitung, May 12, '90).

[Several years ago I observed distinct movements in the red corpuscles in a case of pernicious anæmia, but made no public mention of the interesting fact. F. P. Henry, Assoc. Ed., Annual, '91.]

Large number of amœboid corpuscles found in fresh-blood preparations, larger than red corpuscles, and possessed of very active movements. Perles (The Medical Press, June, '93).

[In view of the fact that the red blood-corpuscles of pernicious anæmia have been observed by Hayem and others to be possessed of amœboid movements, I would hesitate, in the absence of further proof, to regard the bodies described by Perles as other than degenerated blood-constituents. F. P. Henry, Assoc. Ed., Annual, '94.]

Small, mobile bodies observed, staining the same as red corpuscles and resembling fragments of hæmatins, thought to possess pathognomonic value. Senator (Le Bulletin Médical, May 26, '95).

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Study of fifty cases. Most typical points in the blood: 1. A reduction of the number of red cells to about 1,000,000. 2. The absence of leucocytosis. 3. Possibly a relatively high percentage of hæmoglobin in some cases. 4. Increase in average diameter of the red cells. 5. The presence of large number of polychromophilic red cells. 6. The presence of nucleated red cells, a minority being normoblasts. 7. The presence of myelocytes. 8. A relatively high percentage of small lymphocytes at the expense of the polymorphonuclear cells. Cabot (Boston Med. and Surg. Jour., Aug. 6, '96).

In cases in which the urine is dark, the latter is found to contain pathological urobilin,—a substance known to be derived from the disintegration of hæmoglobin.

Case in which there was an unusually dark color of the urine, which contained an amount of uric acid estimated, on several occasions, to be three times the normal amount. F. Walker Mott (London Lancet, Mar. 16, '89).

Case in which the urine was habitually dark-colored, resembling an "extremely-dark sherry, presenting generally at the same time something of an olive tinge." This color proved, by chemical and spectroscopical examination, to be due to pathological urobilin. W. Hunter (Practitioner, Sept., '89).

The quality of urinary pigment is of secondary importance as compared with the large quantity of urobilin which is so often found. Mott (London Lancet, Feb., '90).

Peculiarity of highly-colored urine is that it presents a low specific gravity, averaging 1014. Presence of pathological urobilin described by MacMunn of high diagnostic significance. W. Hunter (Brit. Med. Jour., July 5, '90).

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Case in which the urine, instead of presenting the appearance upon which so much stress is justly laid by Hunter, was habitually pale. R. Douglas Powell (Clinical Journal, Aug., '96).

The gastric and intestinal disorders are probably due to the formation of a toxin, which, in turn, acts as the etiological factor of the general disease.

Typical case in which, although no special derangement of digestion was complained of, there was found at the autopsy a high degree of atrophy of the glandular structure of the stomach and intestines. Eisenlohr (Medical News, Apr. 2, '92).

Case showing 250,000 red blood-corpuscles per cubic millimetre; hæmoglobin, 11 per cent., in which the most prominent symptoms throughout the course of the disease were gastro-intestinal. At autopsy stomach found in a state of chronic catarrh, with polypoid elevations of the mucosa. The solitary follicles of the small intestine were swollen, and the mucous membrane of the large intestine was slate-colored. The affection is due to auto-intoxication with ptomaines absorbed from the gastro-intestinal mucosa. A. Wiltschur (Deutsche med. Woch., Aug. 3, '93).

Two ptomaines—cadaverin and putrescin, which are never formed except by the action of micro-organisms—found in the urine of a case. They are not the result of ordinary putrefactive changes, for, in scarlet fever, diphtheria, typhoid fever, and other affections in which putrefactive processes in the intestines are in excess, they are absent from the urine. They have been found in no other condition but cystinuria,—three cases, the first of which was studied by Udranzky and Baumann, the last two by Brieger. The presence of these ptomaines in this case indicate the action of special micro-organisms in its causation. W. Hunter (Brit. Med. Jour., July 5, 12, '90).

The addition of putrid serum causing normal blood to rapidly form hæmoglobin crystals suggests the probability that the disease is dependent upon the formation of some poison or ferment associated with micro-organisms. F. W. Mott (London Lancet, Feb. 8, '90).

A definite disease due to the absorption of some certain poison, probably of the nature of a ptomaine. While this absorption may occur in varied cases, such as atrophy of the gastric tubules or invasion of the bothriocephalus, there is always the *superaddition* of a definite disease to the pre-existing one, and this is pernicious anæmia. Griffith and Burr (Medical News, Oct. 17, '91).

The so-called idiopathic, or "cryptogenetic," varieties are probably due to the destruction of the red corpuscles by poisonous substances,—toxins or enzymes formed within the body itself or introduced into it from without. Birch-Hirschfeld (La Semaine Médicale, Apr. 23, '92).

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Analysis of a typical case, characterized by very rapid development and no known cause (intestinal or other):—

Absence of organisms in the blood. ("This by no means proves that in all cases of pernicious anæmia micro-organisms are absent from the blood.")

Presence of Eichhorst's corpuscles in the blood. ("These small, deeply-stained corpuscles are, in my experience, rare.

I have never seen them so numerous as they were in this case.")

Intensity of jaundice, yet the stools were of deep orange and the urine only contained a faint trace of bile.

The urine never very dark.

Absence of parasitic organisms in the stools.

Presence of albumin and a few hyaline tube-casts in the urine merely temporary. ("The temporary presence of albumin is, in my experience, quite exceptional in cases of pernicious anæmia. The hyaline casts were probably the result of the jaundice. In my experience —and this important clinical fact is not, I think, sufficiently known—hyaline casts are almost invariably present in cases of well-marked jaundice.")

Copious uric-acid deposits in the urine. ("I have met with one or two other cases of pernicious anæmia in which large quantities of uric acid were deposited in the urine; in one case the patient suffered from recurring attacks of gout.")

Absence of any degree of cardiac dilatation and of cardiac murmurs. ("Considering the extreme degree of the anæmia, these were remarkable features of the case, and are, perhaps, explained by the rapidity of the course of the disease and the short time that it had been in existence when the patient came under observation.") Byrom Bramwell (Lancet, July 24, '97).

The spleen is generally thought to present no characteristic lesion, although the amount of iron in it is usually increased.

Four cases in which jaundice was noted; no discoverable disease of the liver, but the spleen was enlarged in all; disintegration of effete red corpuscles, a normal function of the spleen, probably carried to excess, more hæmoglobin being discharged into the blood than could be got rid of by normal physiological processes. Bristowe (Brit. Med. Jour., June 2, '88).

Chlorosis and pernicious anæmia are due to irritation of the sympathetic, resulting in altered function of the spleen. Friedrich Krüger (St. Petersburger med. Woch., Dec. 24, '92).

Case in which there was, besides severe hæmolysis, sclerosis of the spleen and pancreas, with marked changes in the suprarenal capsules. Douglas Stanley (Brit. Med. Jour., Feb. 16, '95).

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Case in which a microscopical examination of the spleen showed no increase of connective tissue and a marked diminution of cellular elements, both of the Malpighian bodies and of the spleen pulp. In many of the Malpighian bodies the small, round cells were entirely wanting. A slight reaction for iron, hæmosiderin, was developed by potassium ferrocyanide and acidified glycerin, but it was much less marked than in the liver. There was no granular pigment observed as a result of the extensive destruction of the red blood-cells. James Ewing (Med. Record, Sept. 5, '96).

Case in which the total quantity of iron found in the liver was 0.2433 per cent. by weight calculated to the fresh undried tissue. This is equivalent to about 0.72 per cent. in the dried tissue. The estimation accords fully with the observations of previous observers, as showing the very great increase in the iron contained in the liver in this disease. R. F. Ruttan and J. G. Adami (Brit. Med. Jour., Dec. 12, '96).

The jaundice is probably due to accumulation of iron in the hepatic system.

Case complicated with icterus, which the autopsy proved, by the absence of any disease of liver or biliary passages, to be hæmatogenous. Julius Bartels (Berliner klin. Woch., Oct. 28, '89).

Among forty-four livers taken, without selection, from hospital cases, seven gave the marked iron reaction obtained from the livers of cases of pernicious anæmia. Excessive hæmolysis is but a consequence of defective hæmogenesis. W. Russell (Brit. Med. Jour., July 12, '89).

[In none of these cases was there an antemortem examination of the blood, but from their nature, carcinomatous and

nephritic, it is certain that its quality was seriously impaired. F. P. Henry, Assoc. Ed., Annual, '90.]

Fatal case of pernicious anæmia in a woman aged 49. Chemical examination of liver, spleen, and kidney showing that the liver contained a large proportion of iron in the ferric state, while the spleen was free from iron in appreciable amount. F. W. Mott (London Lancet, Feb. 8, '90).

Autopsy of a case. Iron reaction well marked in liver and kidneys, but absent in spleen; the amount of iron in the liver found by quantitive analysis to be five times greater than normal. T. N. Kelynack and F. J. H. Coutts (Medical Chronicle, Sept., '92).

Case with jaundice, in which the spleen at the autopsy was one-half larger than the usual size, of dark-purplish color, and firm consistence. Guitéras (Medical News, June 23, '88). (See below, General Pathology.)

The posterior and lateral spinal tracts present changes resembling those observed in tabes.

Spinal degeneration, especially of the posterior columns, is frequently observed. In none of the cases examined was the cord found in a normal condition. The columns of Clarke and the posterior nerve-roots never involved. Lichtheim (Berliner klin. Woch., Oct. 14, '89).

Examination of spinal cord in five cases having presented no signs of spinal disease during life. In all, changes—such as capillary hæmorrhages, sclerosis of the posterior columns, and segmentation of the axis-cylinder—found. The same changes observed in three cases of chronic icterus and in a case of carcinomatous cachexia. Minnich (Schmidt's Jahrbücher, July 15, '93).

Case in which pernicious anæmia was associated with disease of the spinal cord. Association first observed by Lichtheim. Inclined to regard the anæmia as primary, and probably the cause of the changes in the cord. Case belonged to the group of postero-lateral sclerosis. H. W. Bowman (Brain, Summer, '94).

Study of seventeen cases. The degree of nervous affection not necessarily proportionate to the degree of anæmia. In pernicious anæmia any of the spinal symptoms of tabes may be present, while symptoms entirely foreign to tabes may also occur. Diseased centres in any portion of white substance, preferably in posterior columns; gray substance, zone of Lissauer, and intermedullary roots remain unaffected. Nonne (Deutsche Zeitschrift für Nervenh., vol. v).

In nine cases localization of centres found to be the same as that given by others,—Nonne, for instance. A primary and possibly toxic affection of the nerve-fibres supposed. C. W. Burr (University Med. Mag., Apr., '95).

Three cases of pernicious anæmia with spinal-cord symptoms, one ending fatally after several weeks. Angel Money (Australasian Medical Gazette, June 15, '95).

Changes in spinal cord similar to those met with in pernicious anæmia may occur in a variety of other diseases, combined with cachexia and marasmus, Addison's disease, diabetes, etc. W. Müller (Berichte der 24 deutscher Chirurgentag, '95).

Microscopical appearances of brain in a case: hæmorrhages in the substance of the hemispheres; round, structureless bodies, resembling corpora amylacea, arranged in groups; fatty degeneration of the cells of the motor region; shrinkage and vacuolation of the cells of Purkinje. Biruli (St. Petersburger med. Woch., June 30, '94).

Literature of '96-'97-'98.

Case with arteriosclerosis, paræsthesia, chronic enteritis, and increased knee-jerk. Small hæmorrhages found post-mortem in the corpora striata and corpora quadrigemina. Microscopical examination showed, besides changes described by others in the posterior columns, hæmorrhages in both the gray and white matter, with degeneration in the anterior and lateral columns of the cord. The change in the gray matter is of chief importance in this disease. Teichmüller (Deutsche Zeitsch. für Nervenheilkunde, B. 8, H. 5, 6, '96).

Results of an examination of the spinal cord in seventeen cases. The spinal changes commence in the cervical region and especially in the middle root-zone;

the lateral and anterior columns may also be affected quite early. The intramedullary white substance alone is affected; the posterior roots and the gray matter are unaffected. The conclusion of Minnich, that the changes are wholly dependent upon disease of vessels and have no relation to degenerations of columns, verified. In typical cases the vessels are everywhere abnormal, hyaline degeneration of capillary walls, obstruction and thickening of the walls constituting the most marked conditions present. Nonne (Deutsche Zeitsch. für Nervenh., p. 313, '96).

Evidence showing that extensive changes may be present in the cord in cases of pernicious anæmia without any marked clinical symptoms, and that the lesions are of somewhat diverse character. Whether the degenerations of systemic tracts depend on hæmorrhagic or myelitic foci in all cases there seems hardly yet sufficient evidence to show; the predominant affection of the posterior columns in the majority of cases, and their degeneration throughout the whole length of the cord on both sides, rather point to an independent affection of these tracts. J. Michell Clarke (Brit. Med. Jour., Aug. 7, '97).

Study of nine cases: small hæmorrhages and consecutive sclerosis are frequently met with in the spinal marrow. These hæmorrhages have no significance from a clinical point of view. The vessels often show thickening and commencing hyaline degeneration (not, however, as a rule), combined with degeneration of the nervous elements. From a study of the literature it appears that comparatively few cases of pernicious anæmia present a real disease of the spinal cord. The symptoms of anæmia remain unchanged in cases in which it does occur, and it is difficult to explain why the cord should be affected in some cases and not in others. The disease of the cord manifests itself with somewhat varying symptoms, certain of which, however, are exhibited in all cases. From an anatomical point of view the alterations have considerable variations; but this is accounted for, to a great extent, by the fact that the process has been observed at a different stage in the various cases. From a closer analysis of the cases it appears that the degeneration progresses in a fairly regular manner. It is presumable that these cases of disease of the spinal cord form a special group, even from a neurological point of view. It may be admitted that some toxic condition is the common, immediate cause of the disease of the spinal marrow as well as of the anæmia. The alterations of the spinal cord are here wholly different from those found in tuberculosis and diabetes, where the changes can easily be distinguished by slightly-marked and chronic degeneration, such as is often found in Addison's disease. Charles Petrén (Inaugural Dissertation, Stockholm; Univ. Med. Jour., Feb., '96).

In cases of pernicious anæmia the degenerative changes in the cord sometimes observed are not the result of mere anæmia, but are more probably the result of hitherto undiscovered chemical agents. A thorough examination of the metabolism in pernicious anæmia might, perhaps, throw further light on the question. G. von Voss (Deutsche Arch. f. klin. Med., vol. lviii, p. 489, '97).

Study of pathological lesions found in the spinal cord in cases of pernicious anæmia showed that there was usually a degeneration affecting the posterior columns, sometimes the posterior and lateral together, but never the lateral alone. This degeneration was chiefly in the nerve-fibres, and was unaccompanied by shrinking of the cord, such as was seen in locomotor ataxia. Seventeen cases analyzed in which initial nervous symptom was always a persistent paræsthesia, usually of the foot, associated with some weakness. This was generally followed quickly by ataxia and loss of motor power, and severe pains in the back and limbs were not uncommon. The disease progressed rather rapidly, so that often within one or two months the symptoms were well developed. In from six months to a year the progress commonly reached its acme, and during this time the anæmia became marked. After a time the control of the bladder and the rectum was lost and in fatal cases death occurred in from six months to

two years. The essential nature of the process was a primary nerve-degeneration affecting the neuraxons first, particular'y in the columns of Goll and the crossed pyramidal tract. The same poison which caused pernicious anæmia was responsible for this disease. It usually developed between the ages of 50 and 60 years, and followed the acute infections, prolonged diarrhœal or dysenteric attacks, lead poisoning, malarial infection, etc. In 10 per cent. or more of the cases pernicious anæmia undoubtedly coexisted. Charles L. Dana (N. Y. Med. Jour., Nov. 19, '98).

The bone-marrow usually presents changes. Those most frequently found, according to Muir, are (*a*) increased number of nucleated red corpuscles in the marrow; (*b*) transformation of the fatty marrow in the shafts of the long bones into red marrow; (*c*) absorption of the bone-trabeculæ between the red marrow.

Bone-marrow of a case composed mainly of hæmatoblasts. Normally, the formation of red corpuscles is probably due to the constricting off, from the nucleus, of the hæmatoblast of protoplasm, colored with hæmoglobin. In pernicious anæmia this process does not take place. Rindfleisch (Virchow's Archiv für pathologische Anatomie, B. 121, p. 176, '91).

Autopsy showing that the marrow had returned to the fœtal condition. A. Pineau (La France Méd., Mar. 11, '92).

The albuminoid constituent of the organism may be at fault.

Fatal case in which examination of the blood-serum showed that the proteids of the plasma were altered in their respective proportions. Adami (Montreal Med. Jour., Aug., '93).

Literature of '96-'97-'98.

Analysis of the blood-serum removed from the right heart: it was clear, almost colorless, had a specific gravity of 1026.1. This is below the figure usually given as being that of the specific gravity of serum,—namely, 1027 to 1030. It contained only 5.2 per cent. of proteids (by weight). These proteids consisted of 2.3 per cent. of globulins precipitated by saturation with magnesium sulphate, and 2.9 per cent. of serum-albumin proper. There was 0.875 per cent. of ash. It will thus be seen that not only were the total proteids reduced about 40 per cent. below the average normal quantity, but also that the normal ratio of the globulins to the serum-albumin was considerably altered; the ash, also, was about 12½ per cent. above the normal. R. F. Ruttan and J. G. Adami (Brit. Med. Jour., Dec. 12, '96).

The disease may be due to some hitherto undiscovered organism.

Literature of '96-'97-'98.

Two cases in which 5-milligramme injections of sublimate daily for the space of two months were followed by rapid improvement. Patera (Riforma Medica, May 23, '96).

The causes of the disease are of a complex nature. Some cases present no appreciable lesions.

A high degree of anæmia usually follows numerous predisposing causes. In some it tends to cause degenerative changes in vessels, leading, in turn, to capillary hæmorrhages, conferring pernicious character. R. Stockman (Brit. Med. Jour., May 4, '95).

[I have for many years maintained that the arguments in favor of the "idiopathic" nature of pernicious anæmia are very faulty. F. P. Henry, Assoc. Ed., Annual, '96.]

Case in which death occurred from gradual asthenia. Entire absence of organic disease in all the organs examined; blood-count gave 1,600,000 red corpuscles per cubic millimetre (32 per cent.), while hæmoglobin amounted to 16 per cent. J. H. Musser (University Med. Magazine, July, 93).

[A disproportion of this kind is certainly unusual in pernicious anæmia. F. P. Henry, Assoc. Ed., Annual, '94.]

Prognosis.—The mortality, from very nearly 100 per cent., has been greatly reduced since the introduction, by Byrom Bramwell, of Edinburgh, of arsenic. A guarded prognosis should always be given, however, relapses being exceedingly common. About one-half of the fatal cases last from one to six months; the remaining seldom reach beyond the second year.

Literature of '96-'97-'98.

In attempting to reach a decision as to the efficacy of any plan pursued in the treatment of pernicious anæmia, it is to be borne in mind that periods of transitory improvement, of varying duration, are often a part of the natural course of the disease; so that too much importance must not be attached to the favorable results that may follow the special line of medication employed. Even if such improvement continue for a long time, the conclusion must not be too hastily reached that the disease is cured. Editorial (Med. Record, Nov. 14, '96).

Treatment.—Arsenic cures the curable cases and benefits the others. Iron is worse than useless, having shown itself injurious in several cases reported. Fowler's solution may be given in 3-minim doses three times a day, increased by 1 minim daily until 30 minims are taken after each meal, provided the stomach does not rebel, which is seldom the case. The patient should be watched and the drug reduced or discontinued temporarily on the appearance of any of the physiological effects of arsenic,—œdema of the lids, etc.

Case in which the red corpuscles were about trebled in number after one month's treatment with arsenic. Suckling (Brit. Med. Jour., Jan. 5, '92).

Arsenic is as much of a specific in pernicious anæmia as mercury is in syphilis. Warfvinge (Transactions of the Eleventh International Medical Congress, '94).

Literature of '96-'97-'98.

Iron produces no permanent benefit.

Acid preparations of phosphorus exert a temporary tonic effect.

Intestinal antiseptics, advocated by Hunter, only of use in cases complicated by gastro-enteric fermentations.

Alcohol (that is, distilled liquors) does no good; malt liquors—ale or beer—if borne well, retard progress of disease.

Arsenic, when tolerated in heroic doses, is very beneficial, but no permanent cures have been authenticated. I. N. Danforth (Boston Med. and Surg. Jour., June 25, '96).

Case, which came under observation in 1892, of a man whose blood showed only 1,600,000 red corpuscles to the cubic millimetre. Under arsenic the red corpuscles rose to 4,000,000 and the man was practically well. In 1893 he relapsed, and on ascending doses of Fowler's solution he improved and went back to work as roller in a rolling-mill. In the following year he returned to the hospital in a worse condition than previously. Again, on arsenic he improved. Now, two years later, he is large and portly, weighing 250 pounds. His hæmoglobin is 90 per cent. and blood-corpuscles 4,800,000. M. H. Fussell (Boston Med. and Surg. Jour., June 25, '96).

Marked case (mentioned under PATHOLOGY) in which large doses of arsenic (for several days the patient took no less than from 50 to 60 minims of Fowler's solution in the twenty-four hours) caused remarkably rapid recovery. The condition of the blood improved and the jaundice removed along with other symptoms.

Table Showing the Condition of the Blood and Dose of Arsenic at Different Dates.

Date.	Number of Red Blood-corpuscles per Cubic Millimetre.	Percentage of Haemoglobin.	Number of White Blood-corpuscles per Cubic Millimetre.	Dose of Liquor Arsenicalis per Diem.
May 5th	810,000	20	.....	20 minims.
May 10th	970,000	28	13,000	40 minims.
May 16th	1,710,000	40	12,000	50 minims.
May 20th	.....	...	.....	60 minims.
May 23d	2,650,000	42	.....	40 minims.
May 26th	2,950,000	46	.....	40 minims.
June 8th	2,700,000	61	.....	40 minims.
June 14th	3,420,000	61	12,000	40 minims.
July 20th	4,010,000	88	14,000	

Byrom Bramwell (Lancet, July 24, '97).

At least two years should elapse before a patient is reported cured. Patient who has been cured of pernicious anæmia for the space of two years by the use of arsenic pushed to the point of tolerance. The gentleman now an active businessman. F. P. Henry (Boston Med. and Surg. Jour., June 25, '96).

There is no specific remedy for pernicious anæmia. Rest in bed is one of the first requisites, the assimilation of food must be stimulated. Lavage of the stomach, intestinal irrigation, and saline laxatives are useful. In rare cases with diarrhœa, calomel may first be given; later astringents, such as tannin. If the urine contain much indican intestinal antiseptics are indicated. Iron is of no value, and in the beginning is contra-indicated. Arsenic is the best remedy; can be given with quinine. Inhalations of oxygen have been employed with advantage. Massage and gymnastic exercises are often of service. After apparent recovery the patient must be carefully observed, as relapses are likely to occur, particularly if the hygienic and dietetic conditions are unfavorable. E. Grawitz (Berl. klin. Woch., Aug. 15, '98).

When the gastric disorder, which is a usual symptom, prevents the administration of arsenic, the latter may be given subcutaneously, while the stomach is treated directly by lavage.

The characteristic symptoms of this affection are often due to removable causes,—such as chronic dyspepsia with dilated stomach. J. Kaufmann (Berliner klin. Woch., Mar. 10, 17, '90).

When there are signs of marked gastric disturbance, washing out of the stomach is indicated. Sandos (Canadian Practitioner, June, '89).

Case in which a complete cure rapidly followed a single thorough lavage of the stomach. H. Meyer (Correspondenzblatt für Schweizer Aerzte, June 1, '90).

An excess of hydrochloric acid is not uncommonly found in the gastric secretions. In such cases Sée recommends an almost exclusive diet of meat and other albuminous foods,—raw meat to the extent of 10 to 12 ounces daily.

Bone-marrow sometimes proves curative.

Case successfully treated with bone-marrow, uncooked, 3 ounces daily. In a case in which the prolonged administration of iron and arsenic in both medium and large doses was proved useless. Thomas R. Fraser (Brit. Med. Jour., June 2, '94).

Very severe case, in which good results attended the use of bone-marrow administered as follows:—

℞ Solution of potassium arsenite, 2½ drachms.
Acid sodium phosphate, 3 ounces.
Extract of bone-marrow, 8 ounces.
A dessertspoonful after each meal.

Danforth (Annales de la Polyclin. de Bordeaux, vol. iv, No. 1, '94).

Effects of bone-marrow are not due to the iron contained therein. Stockman (Brit. Med. Jour., May 18, '95).

Apparent benefit in two cases. Drummond, McCall Anderson (Glasgow Med. Jour., June, '95).

Successful case after a month's treatment. Lenden (Intercolonial Quarterly Journal, Aug., '95).

There is no physio-chemical ground for employment of bone-marrow. J. S. Billings, Jr. (Johns Hopkins Hospital Bulletin, Nov., '94).

Literature of '96-'97-'98.

The plain marrow cannot always be administered on account of the objection of the patients. The red marrow from the tibia of the calf, mixed with an equal quantity of glycerin and rubbed up in a mortar, results in a preparation of pleasant taste and one that can be eaten with bread without disturbing the stomach. The preparation may be made more fluid by the addition of claret or port wine. Alfred Stengel (Therapeutic Gazette, No. 13, '96).

Severe case of pernicious anæmia, complicated with œdema, ascites, and cardiac symptoms, 2¾-ounce doses of fresh bone-marrow administered daily in soup or on bread. The patient was cured in

two and a half months. Blumenau (Pediatrics, June 15, '97).

(See also ANIMAL EXTRACTS.)

In pernicious anæmia bone-marrow is not by any means of constant value. Such cases with large doses of iron and arsenic do very often improve. But herein lies the difference clinically between simple and malignant anæmia: in the former complete cure results, but with tendency to relapse, when the case is appropriately treated. In the latter, at the best some improvement occurs. The amount of hæmoglobin increases, but does not attain the normal, and in no long time the patient is as bad as ever. T. G. Stewart (Clinical Journal, Sept. 14, '98).

Transfusion of blood should be resorted to when improvement does not follow the administration of arsenic.

Transfusion of blood recommended. Blood a very indigestible substance. The practice of drinking it at slaughter-houses is not to be commended. Laache (Wiener klin. Wcch., Sept. 18, '89).

Case treated successfully by transfusion of blood defibrinated and mingled with a 2-per-cent. solution of phosphate of sodium in the proportion of 5½ ounces of the former to 3 ounces of the latter. W. G. Evans (London Lancet, May 13, '94).

[Transfusion should never be omitted if improvement does not follow the free use of arsenic. The best method is that employed by Brakenridge, of Edinburgh (Edinburgh Med. Journal, Oct., '92). The blood is kept fluid by admixture with one-third part of its bulk of a 1-to-20 (5 per cent.) solution of phosphate of soda in distilled water kept at blood-heat. John Duncan, who performed the transfusions in Brakenridge's cases, insists upon the necessity of slowness in operating. He regards thirty minutes as the minimum time that should be occupied in injecting 8 ounces of the fluid.—F. P. HENRY, Assoc. Ed., Annual, '94.]

Defibrinated blood may be used subcutaneously.

Case, showing 840,000 red corpuscles per cubic millimetre, cured by the subcutaneous injection of defibrinated blood. Westphalen (St. Petersburger med. Woch., No. 2, '92).

Subcutaneous injections of normal saline solution may replace transfusion.

Literature of '96-'97-'98.

Case of a man, aged 55 years, in whom blood-count showed 480,000 per cubic millimetre; hæmoglobin, 20 per cent. There was delirium, vomiting, and diarrhœa. Treatment by subcutaneous injections of normal, saline solution on every alternate day, and the intervening by saline enemata, with arsenic internally. Patient practically well. Alex. McPhedran (Canadian Pract., Nov., '97).

Protonuclein seems to possess curative properties.

Literature of '96-'97-'98.

Marked case in which protonuclein was used as a last resort. A 3-grain tablet ordered to be taken every three hours and all other remedies suspended. Two days later kidneys were acting more freely, but patient's condition otherwise unchanged. The tablets then given every two hours. Three days later very decided improvement. The kidneys were acting freely, skin moist, œdema passing away, and a decided gain in general. Improvement continued several weeks, after which the treatment was altered, the tablets being taken every three hours, together with $^1/_{20}$ grain arsenous acid thrice daily. Recovery. R. P. Beggs (Amer. Medico-Surg. Bull., Dec. 19, '96).

Intestinal antiseptics have been recommended.

The best intestinal antiseptic is beta-naphthol and salol, along with arsenic when that can be borne. William Hunter (Brit. Med. Jour., Apr., '94).

[I would take exception to Hunter's statement that salol is an intestinal antiseptic. "An intestinal antiseptic," according to Bouchard,—and there is no better authority,—"must be more or less insoluble and exert no toxic action on the organism. This definition excludes

salol, which no sooner comes in contact with the alkaline secretions of the intestine than it splits into carbolic and salicylic acids, both of which are rapidly absorbed."

The best intestinal antiseptic is undoubtedly thymol,—a fact which seems to be more full appreciated in Italy than elsewhere. In accordance with the view that pernicious anæmia is due to the absorption from the intestine of substances foreign to the healthy body, and destructive to the red corpuscles, its treatment by intestinal antiseptics is certainly most rational.—F. P. Henry, Assoc. Ed., Annual, '95.]

Literature of '96-'97-'98.

Case that recovered under the use of salol, along with ferratin, bone-marrow, oxygen, arsenic, iron protoxalate, and quinine. Dieballa (Zeitschr. f. klin. Medicin, B. 31, p. 47, '96).

When the disease is due to the anchylostoma duodenale, thymol, 2 to 3 drachms daily, is a very effective vermicide, according to Bozzolo.

Frederick P. Henry,

Philadelphia.

ANÆSTHESIA. See individual anæsthetics.

ANALGEN.—Analgen is a derivative of quinoline and occurs as a white crystalline powder readily soluble in hot alcohol, slightly so in cold alcohol, but insoluble in water. It is tasteless.

Dose.—The dose is from 4 to 10 grains, repeated every three hours if necessary.

Maximum single dose 15½ grains and the maximum daily dose 1 drachm. Schreiber (Amer. Medico-Surg. Bull., Jan. 25, '95).

Although of no pathological significance, the fact that analgen causes a red discoloration of the urine sometimes frightens the patient, and he should be informed of this phenomenon.

Physiological Action. — Analgen seems to act upon the sensitive centres, lowering their excitability. The separation products of the drug are frequently eliminated by the urine, which is of a red color, rendered more marked by the addition of acetic acid,—1 to 10 (Dujardin-Beaumetz and Dubief). Bicarbonate of soda, given internally, is said to prevent this discoloration.

Therapeutics. — Analgen is mainly used in the treatment of conditions in which pain is a prominent feature.

Neuralgia.—In this disorder it often proves very efficient.

Antineuralgic action tested in 22 cases. In 10 of simple neuralgia, 8 recoveries, the 2 failures being in hysterical subjects. In 3 cases of migraine, 1 cured. Succeeded in 3 cases of rheumatic pains. Failed in zona, tabetic pains, and uric toms: an intense headache in 1 patient and buzzing in the ears. Spiegelberg buzzing in the ears. Spiegelberg (Münchener med. Woch., Apr. 4, '93).

Used in 37 cases of pain of various kinds. Six cases of cephalalgia, 3 successes; 12 cases of neuralgia, 6 successes; 10 cases of articular rheumatism, 4 successes; 5 cases of muscular rheumatism, 1 success. Untoward secondary effects: nausea, vomiting, diarrhœa, tinnitus, tremor. Very small doses are given at first, and increased up to 45 grains in twenty-four hours. Scholkow (Deutsche med. Woch., No. 46, '93).

Used in about two hundred cases, the majority neuralgia. The full dose of 15 grains necessary to produce relief. Foy (Med. Press and Circular, June 13, '94).

Analgen presents an advantage over antipyrine in that it is insipid in taste. Spiegelberg (Münchener med. Woch., Apr. 4, '93).

Febrile Conditions.—In the various disorders presenting fever as a prominent symptom, whether due to malaria, infectious processes, or to the undue

presence in the blood of products of elimination, it has been credited with considerable merit.

Analgen is valuable as an antipyretic and germicide. One and one-fourth to 1½ drachms daily cause fall of temperature of from 3½° to 5° F., within half an hour after the first dose of 15 to 30 grains, continuing for three days, often accompanied by profuse perspiration. Phthisical patients experience a peculiar feeling of well-being from its use. In doses of ¾ to 1 drachm it acts remarkably on muscular or acute articular rheumatism. It does not, however, prevent relapses or complications. Maas (Zeit. f. klin. Med., B. 28, H. 1, 2, '95).

Literature of '96-'97-'98.

Used exclusively in 59 cases of children, ages of the patients ranging from 20 days to 13 years old, 33 being various manifestations of malarial poisoning. The dosage varies from 3½ grains to 45 grains in twenty-four hours. No unfavorable action upon the respiration or circulation. Urine deep yellow or red, albumin or sugar never present. Action prompt and efficient, reducing temperature and shortening the period of the disease. Moncorvo (Bull. de l'Acad. de Méd. de Paris, Nov. 10, '96).

ANALGESINE. See ANTIPYRINE.

ANCHYLOSTOMUM. See PARASITES, INTESTINAL.

ANESIN.—Anesin is a trichlorpseudobutyl-alcohol, or acetone chloroform, a 1-per-cent. solution of which is said to possess the anæsthetic power of a 2½ solution of cocaine hydrochlorate. It is also reported by Vámossy as capable of standing unimpaired as a solution for a long time. It is said to be sterile and non-poisonous and to produce no local irritation.

Dose.—The 2-per-cent. solution is used as a local anæsthetic in the same manner as cocaine. It may also be injected subcutaneously.

Physiological Action.—When applied to the tongue, anesin first gives rise to a sensation suggesting the presence on the organ of a foreign body. This soon disappears, and is replaced by local anæsthesia. It acts in the same manner when injected subcutaneously.

Therapeutics.—Anesin has so far been tried as an anæsthetic in diseases of the eye and throat and in minor surgery. It is also credited with hypnotic properties by Kossa.

OPHTHALMOLOGY.—Its main use has been as a local anæsthetic in ophthalmology. Grósz has recommended it, owing to the fact that it does not cause mydriasis. In important operations, however, he prefers cocaine. Anesin only anæsthetizes the spot to which it is applied, its power of diffusion being small. It does not produce anæsthesia of the iris.

LARYNGOLOGY.—Anesin was found by Israï to cause prompt local anæsthesia of the nasal mucous membrane of the pharynx and larynx without giving rise to untoward symptoms. It does not, however, produce, even in strong solutions, the profound anæsthesia resulting from the use of equally strong solutions of cocaine.

MINOR SURGERY.—Antal has tried anesin in dental operations and found it very useful. Hüld found it equally valuable in all kinds of operations, and emphasizes the fact that its harmlessness should insure its preference over cocaine in all minor operative procedures.

Literature of '96-'97-'98.

Anesin in a 2-per-cent. solution gives rise to no local irritation or general poisoning. It is an effective anæsthetic.

V. Vámossy (Deutsche med. Woch., Sept. 2, '97).

ANEURISM. — From Greek, ἀνά, through, and ἐυρύνω, I widen.

Definition.—A tumor containing blood or formed by a localized dilatation of a blood-vessel, communicating with the interior of that vessel. It may involve an artery or a vein, or both conjointly.

Arterial Varieties.—As to cause, arterial aneurisms may be divided into two classes:—

Idiopathic or *spontaneous*, in which the aneurism is due to disease of the arterial walls.

Traumatic, in which it is due to an injury of a perfectly healthy vessel.

Idiopathic Aneurisms.—These are subdivided into three varieties:—

1. *Tubulated*, or *fusiform*, in which the three coats of the artery are dilated simultaneously. The dilatation affecting the circumference as well as the length of the vessel, it presents the appearance of a circular enlargement rather than that of a tumor. It is usually observed in the cranial, thoracic, and abdominal cavities, and is generally smaller than the other varieties of aneurism.

2. *Sacculated*, in which the aneurism projects from the side of the artery or from that of a tubular aneurism. These are usually divided into *true* aneurisms, in which all the coats of the artery are dilated, and *false* aneurisms, in which but two coats of the artery remain,—the internal and the outer. The former do not attain great size, while the latter may assume enormous proportions.

[The distinction made between true aneurisms, where all the coats of the artery are dilated, and false aneurisms (traumatic aneurisms), where the walls do not consist of all three arterial coats, is artificial and incorrect, according to Cohnheim. J. McFadden Gaston.]

A false, sacculated aneurism may be *circumscribed*, the sac in that case remaining whole, or *diffuse*, the sac having ruptured, allowing the blood to become diffused into the surrounding tissues, where it may become imprisoned by an artificial cavity formed by the neighboring cellular tissue.

3. *Dissecting*, in which an early rupture of an atheromatous abscess in the arterial wall has enabled the blood to dissect its way between the internal and external coats until, sooner or later, it makes an issue for itself into the interior of the vessel or exteriorly. In the former case it assumes the shape of a sessile growth. This forms occurs especially in the aorta, where it may suggest the presence of a double aorta, and in the smaller cerebral arteries.

Symptoms.—The patients are sometimes made conscious of the formation of an aneurism by feeling something give way, or a sudden, sharp pain, or, in orbital aneurism, hearing a sound like a percussion-cap.

The subsequent symptoms vary according to the stage of development at the time the case is examined.

During the first stage—*i.e.*, the period intervening between the onset and the time when the sac has become firm—pulsation of the tumor is clearly felt at each beat of the heart. If both hands are placed over it, the expansion of the growth will tend to separate them. When it is possible to apply pressure on the artery above the tumor, its size is diminished, while, if applied below, the contrary is the case. The reason for this is obvious: when the pressure is applied above the aneurism the flow of blood into the cavity is interfered with, while the blood-pressure is increased within

the cavity when pressure is exerted below. This method of examination, however, is not altogether safe.

The pulsations of the heart above the seat of the aneurism are weaker and slightly retarded. Sphygmographic tracings are also modified from the normal type.

Auscultation will reveal a blowing or rasping bruit not only in the aneurism, but also in its artery, extending some distance beyond the sac. This bruit is not present in every case. It is also heard in malignant vascular tumors, but it is strictly localized to the growth, being never transmitted along the artery.

The second stage begins when the aneurismal sac has become firm and resisting, on account of the deposit of laminated fibrin within it. In some cases no fibrinous deposit is formed, so that no second stage can properly be taken as a guide.

The pulsation becomes more indistinct, or even altogether lost, on account of the thickening of the aneurismal wall and the deposit of fibrin. If the layer of fibrin is not of the same thickness everywhere, the pulsation may be more distinct at some points over the sac.

Pressure over the sac causes cessation of the pulsation, but the aneurismal tumor will not vanish, on account of the fibrin deposited within it.

A *bruit* will generally be heard over the sac and along the artery, but, like the pulsation, will be detected with varying distinctness according to the portion of the sac examined.

Pain may be an early symptom of aneurism; it is more commonly found in the second stage, when it may be sharp and lancinating or resemble the aching or boring of ulceration. It is due to the pressure produced by the tumor on the nerves, and is consequently intense in popliteal aneurism along the course of the popliteal nerve, which is, at times, flattened out upon the tumor.

Literature of '96-'97-'98.

Case in which there was no pain: a very constant symptom in thoracic aneurism. Nevertheless, the face flushed when the head was lowered, there was tracheal tugging; no fremitus could be felt over the left side of the chest; there was no pulsation in the left carotid, and the radial pulse on the left side was small. The loss of fremitus is one of the earliest signs of aneurismal pressure. Glynn (Brit. Med. Jour., Feb. 6, '97).

If located in one of the extremities, œdema of the limb constantly occurs after the aneurism has reached a certain size. It is due to pressure upon the veins, and may not only be painful, but also terminate in ulceration and sloughing.

Gangrene is a late symptom and may suddenly be caused by an embolus. Usually it is due to excessive œdema.

An aneurism may press upon various organs. If bone is compressed the pain is boring and gnawing, and results in the absorption of the osseous tissue.

Glands may, through this cause, cease their functions.

Compression of the trachea causes difficulty in respiration; of the œsophagus, trouble in swallowing. If the thoracic duct is interfered with, nutrition is impaired.

A peculiar brassy cough is produced by compression of the recurrent laryngeal nerve. Hiccough is frequently a result of pressure on the phrenic nerve, while marked capillary congestion may be caused by pressure on the sympathetic nerve.

Literature of '96-'97-'98.

Case of thoracic aneurism in which there was at no time marked difficulty of deglutition nor any change in the voice. Aneurism involving the ascending, transverse, and upper portion of the descending aorta. Large as it was, the resulting displacement of the trachea was but slight, and its lumen was not diminished. The œsophagus, too, had escaped compression. The tumor measured 8 inches in its long diameter and 5 inches in the short. Its depth from before backward was $4\frac{1}{2}$ inches. The largest portion equaled in size the head of a newborn child. A. A. Smith (Med. News, Oct. 30, '97).

Presence of a small, walnut-sized aneurism in a syphilitic man, 32 years of age, running its course almost to the end without pain, but producing, by pressure on the trachea, a peculiar, paroxysmal cough that differed from the ordinary brassy cough of aneurism. Death occurred from heart-failure. T. Sydney Short (Pract., Dec., '98).

Intracranial aneurism may give arise to hemiplegia, facial paralysis, deafness, ptosis, blindness, or strabismus, caused by pressure on various nerves.

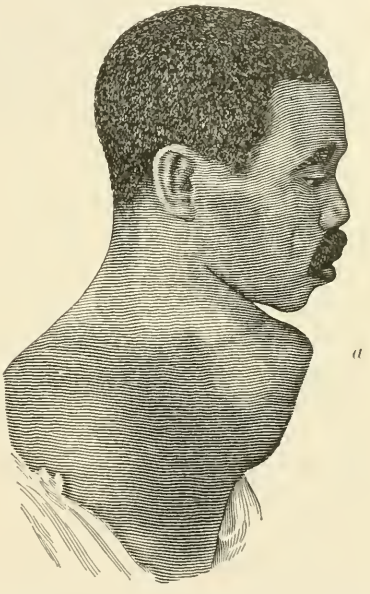
Literature of '96-'97-'98.

Case of aneurism of the middle cerebral artery in a male 65 years of age. The attack had begun with a very marked vertigo. Soon after he was discovered he became speechless. Breathing was very slow and irregular, and face was flushed. Both pupils were contracted, the right one slightly more than the left. Paralysis of the left side, which gradually increased and extended to the left leg. Death on the second day. On autopsy, very decided hardness of the middle cerebral artery found, and an aneurismal sac dissected out, which measured one centimetre in length and one-half centimetre in diameter, and was ovoid in shape. On first examination it had closely resembled an ordinary cerebral hæmorrhage. T. M. Prudden (Med. Record, Nov. 13, '97).

Patient with a racemose aneurism affecting the internal coverings of the brain, producing neuritis and atrophy of the optic nerve, with neuralgia of the infra-orbital. The disease commenced about two years ago with rhythmical sounds in the right ear, and severe painful attacks of neuralgia on the right lower jaw. No headache, no vomiting, nor vertigo. Hitchmann (Med. Press and Circ., vol. cxvi, No. 12).

Differential Diagnosis.

Abscess.—Although in abscess the



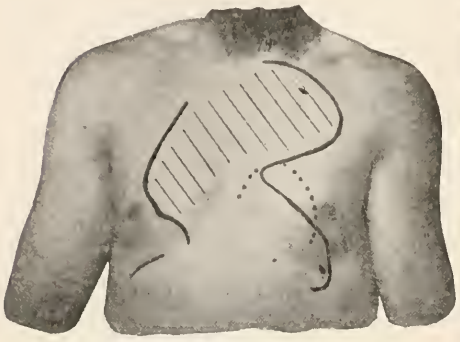
Aneurism of the ascending, transverse, and upper portions of the descending aorta. *a*, Point of rupture. (*A. A. Smith.*)

pulsation is distinct, it is not expansile. If the artery above the abscess be compressed, pulsation will be felt as soon as pressure is removed, and not, as in aneurism, only after the aneurismal sac has been filled.

Literature of '96-'97-'98.

A case of aneurism of the femoral artery in a child which simulated, to a certain extent, an abscess resulting from coxalgia. Differential diagnosis was

made on the presence of expansile pulsation, a well-marked thrill and bruit, and the presence of heart disease. Sac was opened and cleared of clot. Johnson (Quart. Med. Jour., Oct., '98).



Thoracic aneurism. Examination with fluoroscope: The curved line in the upper part of patient's left chest and the curved line on his right chest indicate the outline of the aneurism as seen in the fluoroscope. The lower curved line on the left chest marks the outline of the heart; the lowest curve on the right front, part of the outline of the diaphragm; the dotted line, the cardiac area as determined by percussion. This case shows how a large aneurism may exist in the chest without giving rise to marked physical signs. (*F. H. Williams.*)

Pulsating Tumors.—Vascular sarcoma, pulsating encephaloid, hæmatocele, and erectile tumors in general are, as a rule, not expansile. This differential sign is especially valuable when a tumor overlies an artery.

Rheumatism.—The pain of aneurism sometimes suggests rheumatism at its onset, especially when the aneurism is popliteal.

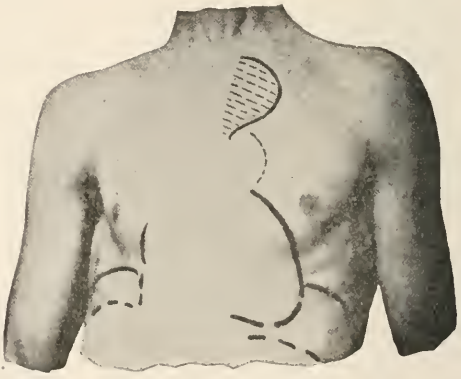
Neuralgia.—Pain is strictly localized, and none of the symptoms denoting an expansile growth are present.

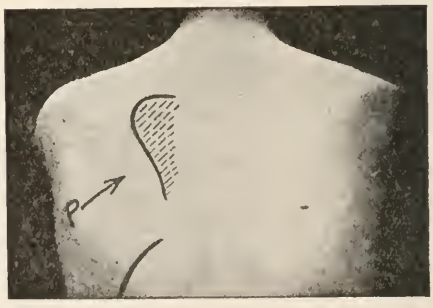
Arterial Pulsation. — Localized, but not persistent, pulsations of arteries may simulate aneurisms, and have been described by Paget and West under the names of *mimic* or *phantom aneurisms.*

Hæmothorax and Empyema.— These complications of pleuro-pulmonary diseases may be simulated when an aortic aneurism has ruptured.

Literature of '96-'97-'98.

Value of x-rays in the diagnosis of thoracic aneurism in which the outlines of the aortic swelling are clearly shown. In one case (possibly of tuberculous adenitis), in which the symptoms suggested an aneurism, the sciagraph showed no enlargement of the aorta. The arrest of the x-rays by an aneurismal tumor is due to the blood and probably to the iron contained in it. Tuberculous deposits are thought to be impervious to the rays, but this is still a matter of some uncertainty. In the cases in which aneurism existed, the diagnosis had already been made, but





These two figures show a smaller aneurism of the aorta. The arrow on the dorsal side points to where the pulsation was best seen. (*F. H. Williams.*)

the picture made by Roentgen rays confirmed this diagnosis. William Pepper (Med. Record, Nov. 28, '96).

Aneurisms of the thoracic aorta can sometimes be detected earlier by x-ray examination than in any other way. In obscure cases, where an aneurism of certain portions of the aorta is suspected, but does not exist, it may be excluded by an x-ray examination. (See woodcuts.) Francis H. Williams (Amer. Jour. Med. Sciences, Dec., '97).

As aneurisms of the valves are chiefly dependent on endocarditis and atheroma, the symptoms are those of these diseases, and they have no separate symptomatology; yet the auscultatory phenomena may have diagnostic significance. Aneurism of the mitral may produce a rudimentary murmur immediately following the systole. Frequently in perforated aneurisms the sounds are most peculiar—humming, blowing, groaning, hissing, singing, whistling, scratching, piping, or musical. A musical murmur, especially in the aorta, which was not present in an apparently-healthy individual the day previously, may be looked upon as dependent on valvular aneurism. Musical murmurs due to aneurisms may disappear for days and then return. They may vary in time, place, and quality. They can only be properly interpreted when taken in connection with other physical signs yielded by the heart. Drasche (Wiener klin. Woch., Nov. 10, '98).

Etiology.—Age is an important factor, aneurisms being observed especially in adults in their prime,—*i.e.*, between thirty and forty years of age. This is due to the fact that men are still engaged in vigorous occupations at that age, neither the heart nor the muscles having lost their strength, while it is then that arteries begin to show symptoms of degeneration. In very young people aneurisms are exceedingly uncommon.

As to sex, females, owing to their less active life, are but little affected with aneurism, the proportion being one to seven, as compared to males.

Spontaneous aneurism is usually due to degeneration of the artery-wall caused by atheroma or adipose infiltration. As a result, the artery is unable to contract during the cardiac diastole, and its diminished resistance to the pressure of the blood caused the vascular walls to gradually dilate. As atheroma presents itself chiefly during middle life, while physical use of the system is still violent, this class of aneurism is most frequently met with in people between thirty and forty years of age. Inflammatory changes are also considered as a prolific cause.

Aneurism is solely a consequence of alterations of the arterial walls, particularly arteritis. Alcoholism accounts for great frequency of this affection in certain countries. Localization in arterial coats depends upon the more or less advanced degree of sclerosis or atheroma. Duplaix (Des Anévrysmes et de leur Traitement, '95).

Literature of '96-'97-'98.

The old theory that degeneration of the wall of the artery always precedes aneurism of any vessel is the true one. Loss of vascular tone can scarcely be accepted as a sufficient cause. A. McPhedran (Can. Pract., Aug., '98).

Case of lad of 15 years, who, while engaging in a game of cricket, met instantaneous death, which the autopsy proved to be the result of rupture of a fusiform aneurism of the ascending portion of the arch of the aorta. There were a few small fatty patches in the sac-wall, as well as in the descending aorta. There was no sign of syphilis, congenital or acquired, nor was there any history pointing to severe strain or to rheumatism. The thymus gland was about the size of an adult hand, each lobe measuring five and one-half inches in length, their combined weight being two and one-half ounces. S. H. Berry (Brit. Med. Jour., Dec. 10, '98).

Aneurism of the abdominal aorta noted in a boy, 9 years of age, who had been repeatedly the subject of rheumatism. There was also atheroma of the aorta, and in two places there were beginning aneurisms of the arch. The aneurism of the abdominal aorta was as large as a golf-ball. It was at the division of the common iliac arteries. R. K. Aitken (Brit. Med. Jour., June 25, '98).

Syphilis is a common etiological factor.

Of nineteen patients 47 per cent. had had syphilis, all under fifty years of age. This illustrates the relation of precocious arteriosclerosis and syphilis. Frænkel (Med. Record, N. Y., Nov. 17, '94).

Importance of syphilitic arteriosclerosis in the production of aneurisms insisted upon. Of twenty-eight cases syphilis found to exist in twelve. Heiberg (La Semaine Médicale, July 27, '92).

Among European residents of Japan aneurisms of the abdominal and thoracic aorta are very frequent; syphilis is very common. Eldridge (N. Y. Med. Jour., Feb. 10, '94).

Literature of '96-'97-'98.

Syphilis found to be a possible cause in one hundred and sixty-six cases out of two hundred and forty. In twenty-eight of the one hundred and sixty-six cases syphilitic lesions were present. The greatest frequency of aneurisms occurs between five and ten years after syphilitic infection.

In the great majority of cases aneurisms due to syphilis cannot be distinguished from aneurisms due to other causes, nor are any special pathological lesions present. Differentiation by treatment is not reliable. Etienne (Ann. de Dermatologie, vol. viii, p. 1, '97).

The term "dissecting aneurism" has been applied to a form in which, the inner walls of the aorta or one of the large arteries having ruptured, the outer coats remain intact, the blood dissecting a passage between the layers of the middle coat. There are altogether about two hundred cases of this condition recorded, and in by far the larger number of these death evidently occurred either immediately or within a few hours, most frequently by the blood forcing its way into the ascending aorta and thence into the pericardial sac. Only in a small percentage of the cases was compensation established and the dissecting channel repaired either by the development of secondary openings into the vessel or by the organization of the blood, which, after escaping between the walls, became clotted. There are singularly few cases on record of this last mode of repair; it is more common to find that, where death is not the direct result of the condition, the dissecting channel gains an endothelium, a channel being formed, opening above and below into the aorta or one of the larger arteries, and resembling the primitive vessel so closely that it is not to be wondered at that some of the earlier cases of the condition were described as congenital abnormalities. (Adami.)

Dissecting aneurisms may be due, in the old, to atheromatous change; in the young to congenital malformation of the central organs of the circulation; sometimes, also, to traumatism. Hypertrophy of the heart, especially in its left half, is often present. Traces of peri- or endo- carditis are often to be noted. The rent in the inner coat sometimes precedes, sometimes follows, the distension. A number of rents may occur in the same subject.

Literature of '96-'97-'98.

Double aorta and dissecting aneurism. The upper and posterior wall of the aorta exhibited an opening one-fourth of an inch in diameter and nearly round. The aneurism had its origin in a rupture, not of the main artery, but in a

channel to the left of it. It had stripped off the pleura on the left side and had broken through this, causing the fatal hæmorrhage into that cavity. A careful examination showed that there was a duplication of the aorta from the left subclavian down, the two portions being separated by a complete septum. The right was the larger and was in line with the descending limb of the arch. The left branch did not exhibit arteriosclerosis.

This condition is very rare. Krause cited five examples of double aorta. In view of the fact that in the development of the human embryo the right and left systems of arterial arches fuse together at a very earlier period, it is astonishing that the man should have lived to a good age in health and comfort. Williams (Med. Record, Aug. 1, '96).

As to the etiology of dissecting aneurisms, it is probable that neither trauma nor disease plays any part in the majority of instances. It is more than likely that the initial tear in the inner coats is due to the distension of the lumen of the vessels in consequence of the increased action of an hypertrophied left ventricle. That the intima and media, and not the adventitia, should be torn is explained by the fact that the adventitious coat is more elastic than the other two. Flockmann (Münch. med. Woch., July 5, '98).

Valvular aneurisms are most frequently found in the mitral valve. The anterior leaflet is more frequently affected than the posterior. The effects of the aneurisms may cause narrowing of the auricle or the ventricle. Aortic valvular aneurism may project into the aortic opening and cause obstruction. Large mitral aneurisms may cause stenosis of the left auriculo-ventricular orifice. Perforation of the aneurism may lead to bulging and even perforation of septum. Drasche (Wiener klin. Woch., Nov. 10, '98).

Aneurisms are sometimes of parasitic origin and caused by embolism or by erosion of the arterial wall from without. —ordinarily due to tuberculous foci as found in cavities in the lungs. Spontaneous aneurisms are common in patients with increased intravascular pressure, as in Bright's disease or valvular disease of the heart.

Every horse has an aneurism, from the size of a pigeon's egg to that of a man's head, in the mesenteric artery of the cæcum, caused by the sclerostomum armatum. Czokor (Inter. klin. Rund., Nov. 26, '93).

Exciting Causes. — Weakness and thinness of the internal and medial coats of the arteries predispose to aneurisms, especially in localities like the popliteal space, subject to frequent movements. Small, incomplete tears occur in the wall of the vessel, and these gradually increase. Violence may then produce a rupture of one or two of the coats of an artery and act as an exciting cause.

An artery may be torn or unduly stretched by a fracture or dislocation, or by attempts made to reduce the latter.

Literature of '96-'97-'98.

Case of traumatic aneurism of the axillary artery due to attempts at reduction of a dislocation of the shoulder. Death soon after the operation. A small opening found in the axillary artery only large enough to admit the end of a probe; the sac was enormous and during life had not pulsated. The veins, which had been also injured, opened into the aneurism.

Case of traumatic aneurism due to attempted freeing of the shoulder-joint, in a case of ankylosis following gonorrhœal arthritis. Sonnenburg (Berliner klin. Woch., p. 681, July 27, '96).

Any violent or sudden exertion may also act as an exciting cause either by unduly stretching the artery, by forcing blood under a high pressure through it, or by causing the heart to act irregularly and forcibly.

Literature of '96-'97-'98.

Case of child which, when first seen, when nine days old, had in the left axilla a tumor, soft and compressible, dilating synchronously with the heart, and over which a bruit could be heard, but there was no aneurismal thrill apparent. This tumor had not been noticed at birth by the midwife, but some days later a small, soft swelling was observed which gradually filled the entire axilla. The tumor was flattened and soft, covering the anterior aspect of the shoulder and a small part of the upper arm; beneath, it extended beyond the posterior border of the axillary space. The child had been roughly handled a day or two after birth, during the performance of some occult ceremonial rites, part of which rites consisted in handling the child dangling by one arm from one person to another over the banisters. When shown, child was in excellent health, after having passed, however, through a period of some months' suffering. W. C. Mardorf (Med. Rev., May 14, '98).

Riders are frequently the subjects of popliteal aneurisms. This is due to obstruction of the arteries caused by the bending of the legs and the contraction of the leg-muscles, to which may be added the jars which are constantly given to the column of blood thus formed.

Pathology.—The structure of a sacculated aneurism, from without inward, is as follows:—

1. An adventitious sac formed of condensed areolar tissue.

2. The real sac, which may consist of the thickened external coat and, perhaps, a portion of the middle coat (false aneurism) or of all the coats (true aneurism). The athermatous and calcareous patches may serve to distinguish the inner and middle coats.

3. Concentric decolorized fibrinous layers, harder and drier toward the exterior and toward the interior softer and redder.

4. A soft, current-jelly coagulum, which may, however, be formed previous to or after death.

The fibrinous deposit on the wall of the sac acts favorably by diminishing the dilating force of the circulation in the sac and by strengthening the wall. The mouth of the sac is round or oval, and measures much less than a section of the sac.

If the contents of the sac be examined they will be seen to vary according to the stage of the disease. The wall of the sac is very thin in the first stage, and contains fluid blood only; in the second stage the centre only of the sac will contain fluid blood, around which are placed laminæ and fibrin; at the periphery a much thicker wall of fibrin is present. The laminæ of fibrin next to the wall are dry, friable, and opaque, while, as the centre of the aneurism is approached, they are soft and red.

Fibrin is rapidly deposited in sacculated aneurism, being more rapidly formed where the obstruction to the free passage of the blood into and out of the sac is greater.

Many sacculated aneurisms are probably true aneurisms at first, but, on increasing in size, the inner coats of the artery rupture and the aneurism becomes a false aneurism.

In tubular or fusiform aneurism the vessel is also elongated. Several tubular aneurisms may exist in the course of the same vessel, the artery remaining healthy between them.

In tubular aneurism the three coats of the artery are preserved, but the middle coat, not undergoing hyperplasia, its elements no longer form a continuous layer, but are separated one from another. The sac, in this form of aneurism, being, in reality, only an enlargement of the lumen of the vessel,

exposed to the full current of the blood, no laminated fibrin is found in it.

As compared to other tissues, the skin resists longest the pressure from aneurism.

Aneurisms are most common in the thoracic aorta (ascending and transverse portions) and next in the popliteal, carotid, subclavian, innominate, and axillary. The most important aneurisms on small arteries are those in the brain, lungs, and heart.

Literature of '96-'97-'98.

Case of hepatic aneurism. The patient, a man 42 years of age, was kicked in the abdomen by a horse. This was followed by pain in the hypochondrium, intermittent icterus, vomiting of blood, and the passing of fresh or altered blood by the rectum. The diagnosis was ulcer of the duodenum. Laparotomy was performed, but without revealing the seat of the hæmorrhage. Nevertheless gastro-enterostomy was resorted to. The patient died five days later. The autopsy showed a spurious aneurism of the right branch of the hepatic artery, in the liver-tissues, and communicating with the right branch of the hepatic duct. Analysis of nineteen cases previously reported showing that the diagnosis is never made during life, the condition being mistaken for ulcer of the duodenum or gall-stone. Mester (Zeitsch. f. klin. Med., B. 28, p. 93, '96).

Case of aneurism at apex of heart; the patient, a woman, 86 years of age, had never complained of any cardiac trouble, and death resulted from apoplexy. The autopsy showed a small aneurism at the apex of the heart, with complete absence of cardiac muscle at the apex of the left ventricle. There was a replacement fibrosis at this point. Some parts were quite calcareous, and there was also slight interstitial myocarditis. The coronary artery was the seat of atheroma. Larkin (Med. Record, Aug. 28, '97).

Case of multiple aneurism of pulmonary artery in a boy, aged 12 years, in whom a loud, roaring, pulmonary systolic bruit and very highly-accentuated second sound were present during life, with hæmoptysis, epistaxis, and dropsy. Four of the secondary branches in one lung, and three in the other led into aneurisms as large as walnuts, filled with blood-clot. The boy had been ill for a year. Churton (Brit. Med. Jour., May 15, '97).

Prognosis.—Spontaneous recovery occurs but seldom; a deposit of fibrin due to a slow current takes places in the sac and completely fills it, forming a firm and solid mass. The process may extend still further into the artery, thus rendering the cure still more secure. The formation of an embolus is only to be expected, however, when the diseased artery is small. Spontaneous recovery may occur in other ways: from a clot being washed out of the sac into the artery, forming an embolus which completely arrests the current in the sac, the latter being filled with a firm coagulum.

The sac may also be heavy enough and so situated as to stop the current of the blood in the artery by causing flexion of the aneurismal neck.

In some cases inflammation of the sac and coagulation of the blood contained in it also effect a spontaneous cure.

Only small aneurisms are cured by spontaneous formation of a thrombus in the sac and its conversion into cicatricial tissue.

Death may result in various ways:—

1. By rupture of the sac. In this case death may occur instantly, if the opening be into a serous cavity, one of the pleural cavities (generally the left), or into the pericardial or peritoneal cavities, the serous membrane giving way in a rent.

Ten cases of sudden death due to rupture of thoracic aneurisms previously un-

suspected. Deaths, although sudden, not instantaneous; sometimes considerable period may intervene. F. W. Draper (Boston Med. and Surg. Jour., Mar. 14, '95).

Case in which death did not occur for five hours after the onset of symptoms, —severe abdominal pain and intense rectal tenesmus. Philip James (Sanitary Engineering, London, Apr. 1, '95).

Case of rupture of the horizontal portion of the arch of the aorta in which the patient lived nine days. At post-mortem dissecting aneurism found and an effusion into left pleura of two and one-half quarts of blood. Atheroma in horizontal portion of aorta rarely observed. Nissim (Bull. de la Société Anat., Paris, Oct., '94).

Case of rupture of an aortic aneurism into superior vena cava. Point of greatest intensity of murmur had suddenly risen from third to second cartilage. Explained post-mortem by finding two ulcers in vena cava. Alex. Bruce (Edinburgh Med. Jour., Apr., '95).

Literature of '96-'97-'98.

Cases of rupture of intrathoracic aortic aneurisms met with in the Pathological Department of the Manchester Royal Infirmary.

Number and proportion of cases: Among the last 4593 cases submitted to pathological examination rupture of a thoracic aneurism has been noted in 32 cases. This gives a percentage in all "general" cases of 0.69.

Sex: Of the 32 cases, 30 were men and only 2 women; that is, a percentage of 93.75 males and 6.25 females.

Age: The exact age was obtained in 30 of the cases; the others were middle-aged males. The average was 40 years. The males averaged 40.4 years. The females averaged 34 years. The youngest subject was aged 20 years and the oldest was aged 65 years.

Seat of aneurism: In many instances the greater part of the arch was involved. Grouped, however, according to the chief area of affection, they may be arranged as follows: Ascending portion of arch, 12; transverse portion of arch, 11; descending portion of arch, 4; and descending thoracic aorta, 5.

Point of rupture: This can be best indicated in tabular form:—

Part Ruptured into.	No. of Cases.	Percentage.
Pericardium	13	40.62
Pleura (left)	7*	21.87
Œsophagus	3	9.37
Externally	3	9.37
Trachea	2	6.25
Pleura (right)	1	3.12
Lung (left)	1	3.12
Bronchus (right)	1	3.12
Superior vena cava	1	3.12

* One of these was a case of dissecting aneurism.

Nature of death: Of the thirty-two cases, six were observed in medico-legal investigations, the subjects being brought dead to the hospital, having been found dead or suddenly seized in the street or elsewhere. In one instance a man, while riding in a cart, suddenly fell out of the vehicle and was picked up dead. In nearly all the cases where rupture occurred while in hospital or where a clear history could be obtained death was sudden, in many instances being practically instantaneous. In one case, where rupture occurred into the œsophagus, death took place in five minutes. In another, where the aneurism burst into the pericardium, the patient felt faint and was dead in three minutes. In one subject, where the pericardium was found filled with blood, and where there was commencing erosion into the trachea, with also extension into the left lung, a small quantity of frothy blood was brought up for some hours before death, which was sudden. In a case where there was general aneurismal dilatation of the arch of the aorta, rupture took place into the pericardium through a vertical slit two and a third inches in length. The patient was brought to the hospital in what appeared to be a syncopal attack, and died suddenly four hours later. In one case where death occurred suddenly, blood-clot weighing eighty-five ounces was found in the left pleural cavity. T. N. Kelynack (Lancet, July 24, '97).

Death is not so rapid when the aneurism reaches to the skin or to a mucous

membrane, such as the trachea, œsophagus, intestine, or bladder.

The rupture of an aneurism through a mucous surface occurs by the formation of a small, circular abscess; through a serous surface the rupture is by a fissured or star-like opening. In the skin a small slough is formed, which, on falling, leaves a minute opening, through which the blood passes. This is soon

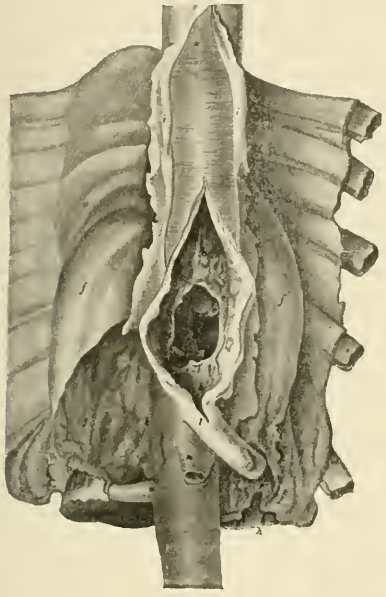


Fig. 1.

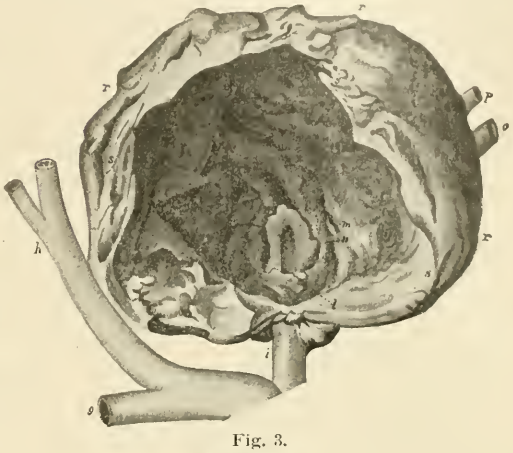


Fig. 3.

Fig. 2.

Fig. 4.

Pathological specimens of ruptured aneurisms. (*Scarpa.*)

Fig. 1.—Ruptured aortic aneurism. *a*, Thoracic aorta stripped of its pleura and cellular coat; *c*, *c*, Rupture of the posterior wall of the aorta; *f*, Aneurismal sac covered by the pleura; *h*, Rupture of the aneurismal sac.

Fig. 2.—Ruptured aneurism of the arch of the aorta. *b*, *b*, Bottom of cavity showing the location of the rupture of the artery.

Fig. 3.—Ruptured carotid aneurism. *l*, Inferior orifice of left carotid artery, ruptured; *m*, Superior orifice of the left carotid artery; *h*, Right carotid; *r*, Aneurismal sac.

Fig. 4.—Ruptured popliteal aneurism. *a*, *a*, Ruptured popliteal aneurism farther opened; *b*, Artery; *c*, Superior orifice of artery; *d*, *d*, Portion of aneurism torn.

arrested by clotting, but the hæmorrhage soon recurs and death is finally caused by repeated hæmorrhages.

2. Death may occur from the compression of important organs. Pressure upon the trachea, bronchi, or lungs causes suffocation; upon the esophagus or thoracic duct inanition.

In tubular aneurisms death may be caused by syncope due to impediment to the circulation or by compression of the œsophagus or bronchi or by rupture into the pericardium.

When the vertebræ and ribs are compressed these bones are absorbed and spinal irritation and even meningitis are produced. Pressure upon the intercostal nerves gives rise to severe neuralgia.

3. Inflammation and suppuration of the sac may cause death by inducing septicæmia and pyæmia.

4. If the aneurism is in the arch of the aorta a clot may be carried to the brain by the cerebral arteries, causing embolism and death.

5. Gangrene of an extremity caused by obstruction may cause death by septic infection.

A sacculated aneurism usually forms upon a tubular aneurism and causes death more rapidly than the tubular aneurism alone would have done.

Duration of Aneurism.—Though an aneurism may grow very rapidly, it lasts several years, in the majority of cases. So long as the cause is present it tends to develop.

The various causes which influence the duration of an aneurism are its situation, the size of the mouth of the sac, the condition of the latter, the force of the blood-current, the state of the blood as to coagulation, and the mode of life of the patient.

Treatment of Aneurisms in General.—Obliteration of the sac and occlusion of the afferent and efferent vessels are the aims to be reached.

The best results may frequently be obtained by combining several modes of treatment.

Obliteration of the sac can be obtained by diminishing the force of the circulation of the blood in it, thus encouraging coagulation.

Tuffnell's Method. — The best-known method in this connection is that of Tuffnell, which, though usually employed for internal aneurisms, has also been advantageously used for aneurisms of the extremities.

The object of Tuffnell's treatment is to reduce the watery elements of the blood and to increase the solid elements.

The patient is kept in the recumbent position for at least three months; this causes the rate of pulsation to diminish greatly. In one case it fell in a few days from 96 to 66,—a reduction of 30 beats a minute, 1800 beats an hour, and 43,200 beats a day. No drug can cause such a diminution without danger to the patient. The recumbent position, according to Tuffnell, acts upon the circulation in internal aneurism as does mechanical compression in external aneurism. The food is diminished, amounting to but 10 ounces of solid and 6 ounces of fluid in the twenty-four hours.

Tuffnell's food consists of 2 ounces of bread and butter and 2 ounces of milk for breakfast; 2 or 3 ounces of meat and 3 or 4 ounces of milk or claret for dinner; 2 ounces of bread and 2 ounces of milk for supper.

Rest and restriction of liquids are the most important parts of the treatment.

Tuffnell published his first observations in 1875. Of ten cases treated seven were cured and three died during the treatment. One case of popliteal

aneurism made a recovery in twelve days.

To induce sleep lactucarium is recommended, and, with the view of diminishing the liquid portion of the blood, the patient is purged from time to time with compound powder of jalap.

Literature of '96-'97-'98.

Results of study of effect upon the blood of Tufnell method of treatment, combined with calcium-salts, in management of two cases of aortic aneurism. Restriction of fluids caused decrease in elimination of calcium-salts, while increase of fluids caused marked increase in their elimination. Water should be given in abundance, if it is desired to saturate the body with calcium-salts. Personal cases absorbed much more calcium while taking large quantities of water. Ingestion of calcium seemed to increase the quantity in the circulating blood. Specific gravity of blood was not distinctly affected by the treatment. The plasma-nitrogen, plasma-albumin, and the quantity of albumin in the plasma of 100 cubic centimetres of blood, were constant in the two cases, except at one estimation. The fibrin-nitrogen was not increased. The time of coagulation was reduced in 1 case, but was not affected by the ingestion of calcium. In the other case the time varied, but was not shortened on the average. Influence of the treatment upon the blood seemed, therefore, entirely negative, although both patients showed distinct improvement in their physical signs. A. E. Taylor (Jour. Exper. Med., May, '98).

Medicinal Treatment.—With the idea that aneurism is often due to syphilis, iodide of potassium has been much employed; its probable action is that of depressing the heart.

The assertion that iodide of potassium has the power of lowering blood-pressure is contradicted by the sphygmomanometer. Alexander James (Brit. Med. Jour., June 29, '95).

The cases reported in which iodide of potassium has been of benefit do not sustain the credit accorded that drug as a curative agent; still it ought to be tried in cases where there is even but a suspicion of syphilitic taint. Bristow (Brooklyn Med. Jour., Oct., '95).

[It may further be said that the drug usually seems to promote the comfort of the patient,—a factor of considerable importance in the treatment of a chronic, incurable, and often distressing disease. Whittier and Vickery, Assoc. Eds., Annual, '96.]

Literature of '96-'97-'98.

In cases which have a history of syphilis, iodide of potassium internally and mercury as an inunction recommended. For some weeks afterward the patient is kept in bed and fed chiefly with milk. Over the situation of the aneurism an ice-bag is applied several times a day for hours. The results of this treatment have, on the whole, been so favorable as to warrant the use of mercurial inunction in cases without a history of syphilis. A rapid subsidence of dyspnœa and bronchostenosis was obtained, the relief continuing sufficiently long, in some instances, to permit patients' resuming their occupation. A Fraenkel (Deutsche med. Woch., Feb. 4, '97).

Case of non-syphilitic aneurism in which 30 to 60 grains of iodide of potassium per day, and an ice-bag applied to the tumor, caused the pulsation to diminish, and in five months the patient, a street-singer, was able to resume his occupation. Edouard (Revue de Méd., May 10, '97).

The calcium salts have been recommended.

Four cases of aneurism in which the amount of calcium salts passed in the urine was much greater than normal; may be useful as an aid to diagnosis. E. Reale (Rivista clinica e terapeutica, Naples, Nov., '91; Brit. Med. Jour., Mar. 26, '92).

Marked improvement from hydrated calcium chloride in doses of 1 drachm daily. Solomon Solis-Cohen (Philadelphia Polyclinic, July 6, '95).

Acetate of lead has been used to

"equalize the circulation," and bromide of potassium is frequently employed against the cough and pain.

Gallic acid, iron sulphate, barium chloride, digitalis, veratrum viride, and aconite have been used, but the majority of clinicians do not look upon these agents with favor.

[In some cases the internal remedies may be assisted by the application of ointments or liniments. The following have been found useful:—

℞ Ung. hydrarg.,
Ung. bellad.,
Ung. iodidi,
Ung. camphoræ, of each, 2 drachms.
M. Sig.: To be applied over the tumor.

℞ Olei terebinth.,
Olei olivæ, of each, 2 ounces.
Pulv. camphoræ, 2 drachms.
M. Sig.: To be applied over the tumor and covered with a bandage, night and morning. J. McFadden Gaston.]

Coagulating Injections.—These have been utilized for aneurisms of the extremities. Tannin, lead acetate, Monsel's solution of iron, spermaceti (Dobell), and other drugs being used.

Cervical aneurisms should not be treated by these injections, lest an embolus be carried to the brain.

To prevent emboli being carried into the circulation the arteries above and below the aneurism should be compressed both during the operation and for some time after it. In the opinion of Tillmann, any treatment by injection is dangerous.

Gelatin Injections. — Injections of liquid gelatin have recently been advocated even in desperate cases.

Literature of '96-'97-'98.

Operative technique of injection of gelatin for treatment of aneurism is as follows: White gelatin in a quantity of from 1 drachm to 1¼ drachms is dissolved in a 7-per-cent. solution of sodium chloride in measure 1 to 2 quarts. The solution is placed in a flask, which is sealed and then sterilized with its contents at a temperature of 120° C. For the injection a flask of the capacity of 1 pint is got ready, fitted with a cork and two tubes like a wash-bottle. The long tube is connected with a sterilized needle and the short tube with an India-rubber air-ball. The gelatin is liquefied in a water-bath at a temperature of 95° F. and poured into the flask, which is also kept in a water-bath. The injection is made slowly into the subcutaneous tissues of the buttock and should take fifteen minutes. It should be repeated every six or eight days until the sac is obliterated. This method, if carried out with care, gives excellent results in the most desperate cases. Lancereaux (Paris Academy of Med., Lancet, Nov. 19, '98).

Relative cures obtained in aneurismal tumors after twelve injections of serum-gelatin. Case cited of Boinet, who had obtained unfavorable results, and a second case in which no results had been obtained by Barth. These injections give good results, and they are to be employed to combat otherwise-hopeless aneurisms of large size, the injections also cause little inconvenience, although they are somewhat painful. The only danger in this treatment seems to be the possibility that the clot, while forming, may in part be swept off into the general circulation. Huchard (La Presse Méd., Oct. 26, '98).

Subcutaneous Injections. — Langenbeck recommends subcutaneous injections of ergotine, which act in two ways: by slowing the action of the heart, thus favoring the deposit of fibrin, and causing contraction of the unstriped muscular fibre entering into the composition of the middle coat of the artery, thus raising the blood-pressure.

Compression.—Compression was used over two hundred years ago for cases of traumatic aneurism, but the first surgeon to propose this method was Heister. In 1772 Guattani, an Italian, compressed the entire limb and the sac in

cases of popliteal aneurism. Cases thus treated usually, however, ended fatally, from transformation of the circumscribed aneurism into a diffuse aneurism, inflammation and suppuration of the sac, and gangrene of the leg. The mortality was 50 per cent.

John Hunter, in 1785, introduced into the treatment of aneurism the governing principle that the current of the blood through the sac should not be completely suppressed, but only diminished, thus allowing the elasticity of the sac to act. In this way the effect of the overpressure from the heart's action is removed.

The fact that the sac in diffused and traumatic aneurism is not contractile explains why this treatment is without success in aneurisms of this variety.

Advantages of compression over ligation:—

1. It is not so dangerous; if necessary, it can be discontinued and then renewed, whereas, in ligation, the danger may be great for many days following the operation.

2. In cases treated by compression only the sac consolidates, just as in spontaneous cure. The arteries, up to the point of compression, are not consolidated, as in ligation.

3. Compression is more successful than ligation, and does not present danger of complications, such as secondary hæmorrhage, sloughing of the sac, phlebitis, gangrene, or pyæmia.

4. Ligation has been followed by a second aneurism or by suppuration in the sac. Though these complications may occur after compression, they are not likely to do so, and consequently compression is more likely to be permanent than ligation.

Compression may be applied with the fingers or by means of various instruments, bags of shot, Esmarch's elastic bandage, flexion of the joint, etc.

Jonathan Knight, of New Haven, Conn., first employed the finger as a means of compression in 1848, and in the same year Willard Parker and James R. Wood, of New York City, each successfully treated an aneurism in this manner.

Digital pressure over the vessel, just above the aneurism, is applied by a succession of assistants relaying one another. The procedure is rendered much less irksome for the operator by placing a weight upon the pressing fingers, the muscular strain being thus, in a measure, relieved.

It is necessary to keep up the pressure from one to several days, until the pulsation has ceased. The average time required is three days. The pressure should then be gradually diminished, in order to prevent disintegration of the clot before it is firmly contracted.

In proximal compression of the artery it is only necessary to stop the pulsation of the sac, it being unnecessary to stop the flow of blood through it. This method succeeds best in sacculated aneurisms. In tubular aneurisms it causes gradual contraction, but not by a deposit of fibrin.

When the sac contains fluid blood only, the chances of success are more favorable. In an already partly-filled sac coagulation may be too sudden and imperfect.

Recovery is shown, when compression above the sac has been resorted to, by cessation of pulsation in the sac when pressure is removed, by no thrill or bruit being present, and by the development of a collateral circulation.

The collateral circulation which develops after the sac has been filled with

fibrin indicates that the sac has been obliterated.

Sudden enlargement of the collateral circulation, occurring both in cures happening spontaneously and in those due to compression, may cause considerable pain. The latter, therefore, may be looked upon as a favorable symptom.

In aneurisms of the extremities and neck compression gives good results. This causes, when cure takes place, the formation of coagula in the aneurismal sac, through or alongside of which, however, a canal remains through which the blood passes. The coagula shrink gradually and become more solid and firmly adherent to the inner wall of the aneurismal sac. Compression can be carried out only with intelligent patients. Billroth (Wiener klin. Woch., No. 50, '93).

[When compression has ultimately to be abandoned, its temporary use is of advantage in so far as it prepares the way for establishment of the collateral circulation. JOHN H. PACKARD, Assoc. Ed., Annual, '92.]

Compression by means of the contractile power of ordinary collodion, in small aneurisms; successful in three cases. Williams (Amer. Medico-Surg. Bull., Apr., '93).

Compression by the Esmarch Bandage.—In this method it is sought to produce red blood-clot, such as is formed when the blood no longer circulates, and not the fibrinous, or white, blood-clot, such as is formed when the blood is in motion. Such a clot contracts, but does not become organized and acts mainly by forming a thrombus in the afferent and efferent vessels.

Pressure by means of an Esmarch bandage was first successfully employed by Reid, of the British navy, in 1875, though in 1864 Murray had already succeeded in treating an aneurism of the abdominal aorta by anæsthetizing the patient and checking the circulation completely by means of an instrument. The patient should first be given a hypodermic injection of morphine, then just enough ether as an anæsthetic to prevent pain and insure quiet.

After placing a piece of chamois-skin over the artery to prevent chafing, the limb is firmly wrapped in an elastic bandage from its extremity up to the tumor; the latter, however, is lightly covered over; but, as soon as it is passed, the bandage is again firmly applied, thus allowing a certain amount of fluid blood to remain in the sac.

A tourniquet is then placed above the aneurism, to prevent disintegration of the clot in the sac and of the thrombi in the arteries by the circulation, and left *in situ* from sixteen to twenty-four hours. The pressure is then gradually decreased by unscrewing the tourniquet, while due attention is paid to the state of the circulation, to avoid gangrene by too prolonged pressure, and to avoid disturbing the clot before it is solid.

A collateral circulation is soon formed. Danger may arise in some cases from the sudden rise and fall of blood-pressure or from rupture of the sac; pressure on the nerves, gangrene, and momentary renal disorders are possible sequelæ.

Pressure may be advantageously aided by the administration of iodides and a limited albuminous diet.

The contra-indications to this treatment are vascular degeneration elsewhere than in the aneurism, renal disease, or inflammation of the sac.

But few appropriate cases in which compression in some form has been faithfully persevered in for a long time have been unattended with improvement.

The method of applying compression preferred by Tillmann is to envelop the limb with an elastic bandage from its extremity up to near the aneurism for

about an hour and a half; a tourniquet should then be applied above the aneurism, and removed with the bandage an hour and a half later. Digital or instrumental compression should follow for from six to twelve hours.

Compression by Flexion. — This method, which was first employed in 1858 by Hart, can only be used for the arm and leg. It consists in bandaging the entire extremity, and then flexing it strongly,—the forearm upon the arm, the leg upon the thigh, or the thigh upon the pelvis.

The effects of this method are to compress the sac itself, to retard the circulation through it, and occasionally to cause a small clot to be dislodged, by means of which the mouth of the latter becomes occluded.

Flexion of the joint can be used only in aneurisms of small or medium size; when the tumor is large the sac might be ruptured. It is an unsafe procedure when the sac is inflamed or when there is much œdema of the leg.

Flexion is especially indicated when the tumor is of small size, the sac not inflamed, and the joint not involved.

An argument in favor of flexion is that if unsuccessful no harm follows the procedure.

Macewen's Method.—The object of this method is to form white thrombi within the sac, by lightly scratching the internal surface of the sac with needles thrust through the previously-asepticized wall. The needles are thus left in contact with the sac until the entire wall has thus been lightly irritated. The position of the needle-points should be changed at intervals of ten minutes. It may be necessary to continue this for forty-eight hours, the sittings being repeated from time to time for weeks or even months. Besides the effect upon the aneurismal currents there occur an infiltration of the parieties with leucocytes and a segregation of them from the blood-stream at the point of irritation.

> The advantage of white thrombi over the red is in the less marked tendency of the former to shrink in volume or to undergo penetration by leucocytes or yellow softening. The object is to obtain an adhesion of leucocytes to the vessel-wall, and to promote successive accretions of these bodies (a parietal thrombus) until complete occlusion occurs. For this purpose a slender pin of sufficient length is employed to transfix the aneurism and to permit manipulation, in order to scratch the inner surface of the opposite wall at various points over its entire extent. Sometimes this can be accomplished by one insertion, but it may be necessary to thrust the pin in at several points. Antiseptic precautions are, of course, to be observed. The length of time during which the pin is to be kept in place varies, but should never exceed forty-eight hours, and may be much less. In the case of a very large aneurism several pins may be introduced at various points, but they should not be too close together. Every aneurism contains within itself a potential cure as the essential matter, whatever may be the method devised for inducing its action. Macewen (Lancet, Nov. 22, '90).

An antiseptic gauze dressing should be applied to the neighboring region while the needle is left in the sac.

One needle usually suffices, but it may be necessary to use two or three.

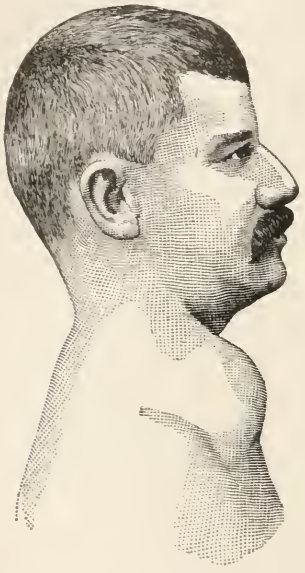
Any superficial ulceration, inflammation of the sac, or erysipelatous induration is a contra-indication.

> Examination of aneurism post-mortem a few days after the introduction of needles according to Macewen's method. The coagulum was found to be composed of two different constituents,—one pale, the other dark brown,—variously intermingled, sometimes with distinct stratification, denoting a mixed thrombus. The pale part composed of fibrin and

leucocytes; the brown part of red corpuscles along with fibrin. R. M. Buchanan (Glasgow Med. Jour., Oct., '91).

Needles may also be used to transfix the aneurism or for the purpose of causing coagulation, as in electrolysis.

In *acupuncture* very fine gilded needles are introduced into the sac, crossing one another, and thus forming a centre around which the blood coagulates.



Case of aortic and innominate aneurism, with erosion of the clavicle and ribs. Photograph was taken thirty-five months after Dr. D. D. Stewart had caused an arrest of the growth of the aneurism by electrolysis. The man finally entered the Jefferson Medical College Hospital because the subjective symptoms of aneurism were returning, and a spot of softening and pulsation was to be felt in the lower right-hand border and at the edge next the xiphoid cartilage. (*Therapeutic Gazette*, Sept., '96.)

They are removed several days later. This method is seldom, if ever, successful.

In *galvanopuncture* two insulated needles are introduced into the sac at about an inch apart, and being brought into contact by their internal extremities a galvanic current is passed through them. This method was proposed by Phillips in 1829. It exposes to embolism, suppuration in the sac, and hæmorrhage through the needle-punctures.

Electrolysis Through Introduced Wire.—The introduction into the sac of filiform material, especially wire, as recommended by Moore (see below) having given evidences of value, D. D. Stewart, of Philadelphia, showed the great advantage of combining electrolysis with the introduction of wire in sacculated aneurisms, and has published cases in which satisfactory results were obtained. The aneurisms treated were not susceptible of cure by medical or surgical means. The procedure is a distinct advance in curative means.

Electrolysis in sacculated aneurisms. Ten feet of gold wire of sufficient calibre to form spirals in the centre of cavity; current closed without interruption seventy-five minutes. No pain. D. D. Stewart (Boston Med. and Surg. Jour., May 23, '95).

Literature of '96-'97-'98.

Case successfully treated by electrolysis through introduced wire. D. D. Stewart and J. L. Salinger (Amer. Jour. Med. Sciences, Aug., '96).

Sacculated innominate aneurism successfully treated by the introduction of gold wire and galvanism. In most of the cases narrated so far any operation seemed hopeless, except in Kerr's second case and Rosenstein's case. Then, too, Stewart's last case will show very beneficial results. Permitting the case reported to rank among the greatly benefited,—and counting Kerr's, Rosenstein's, and Stewart's cases as cured,—we have 30 per cent. of cures, 20 per cent. benefited, and 50 per cent. fatal, and in none of the fatal cases was death the result of the operation; moreover, there is a bright prospect of the case reported bringing the percentage of cures up to

40. E. P. Hershey (Ther. Gaz., Sept. 15, '96).

Final report of a case of a very large innominate aneurism completely cured by the employment of electrolysis through ten feet of snarled, coiled, fine, gold wire, introduced into the sac; death at the expiration of three and a half years from cerebral thrombosis. The newer method consists in introducing into the sac, under the strictest antiseptic precautions, a fine silver or gold, coiled wire, previously so drawn that it may be readily passed through a thoroughly insulated needle of somewhat larger calibre than the wire and, after introduction, assume snarled spiral coils, that, with a moderate amount of wire, the entire calibre of the sac will be reached, unless the cavity be already filled with coagula or the sac be of unusual size (as was the case with one aneurism so treated).

The wire must be neither, in amount or calibre, too great nor too bulky or highly drawn that the results to be desired be interfered with. Nor should the wire be of a material so brittle as steel nor of hard-drawn iron, lest fracture occur in process of contraction of sac, with danger of rupture. Nor should it be of soft iron, as was recommended on theoretical grounds by Stevenson; for, with the last, so great a quantity of detritus will result, due to the decomposition of the iron and the formation of insoluble salts under the current's influence, even with low ampèrage, that danger of emboli result.

Silver or gold wire is undoubtedly preferable material.

The amount of wire required depends necessarily upon the calibre of the aneurismal sac, and must be decided upon with the greatest nicety of judgment, since with too small an amount little or no result will be obtained, and, with too great a quantity, permanent cure through obliteration of sac by contraction of clot cannot be expected. For a globular sac of approximately three inches in diameter, three to five feet are sufficient; for a sac of four to five inches, eight to ten feet.

The anode, or positive pole, should invariably be the active electrode. This is connected with the wire and the negative rheophore—a large clay plate, or an absorbent cotton pad of equal dimensions made after the method of Massey—is placed upon the abdomen or the back. The current is slowly brought into circuit and its strength noted by an accurate milliampèremeter. The increase is gradual for a few moments until the maximum strength supposed to be required is reached. It is maintained at this until the approach of the end of the session, and then gradually diminished to zero, after which the wire is separated from the battery, the needle carefully withdrawn by rotation and counter-pressure, and the released external portion of the wire gently pulled upon and cut close to the skin, the cut end being then pushed beneath the surface. This latter procedure is facilitated by using care in the introduction of the needle to first draw the skin at the site of puncture a trifle to one side, in order to procure a somewhat valve-like opening.

Experience has shown that the current-strength must be rather high—from 40 to 80 milliampères—and the sitting long—from three-fourths of an hour to one and a half hours. Thus used, the following effects may be expected: The mere introduction of coiled, snarled wire without the conjoint use of galvanism, if practiced judiciously, is in itself a method of value, since the presence of wire, if engaging all parts of the sac, acts both as an impediment to the blood-stream and at the same time offers to the eddies set up multiple surfaces for clot-formation. Hence this method has more to commend it than that by mere galvanopuncture with needles. By galvanopuncture, although firm coagula are produced, they are of such trifling dimensions and engage such small areas of sac-wall that, without impeding in the least the blood-current, their dissolution rather than their accretion quickly follows. By the application of a strong galvanic current through coils of wire so disposed that all areas of the sac are reached, it follows without exception, as has been noted in all recorded cases, that

consolidation by virture of clot-formation is promptly and invariably produced. The solidification is rapid, and is generally manifest before the end of the electrical session, through changes apparent to the eye and hand, in the pulsation and in the degree of consistence of the sac-wall. These changes become more decided in the course of a few days, until, after a time, in the most favorable cases a hard nodule, with a communicated pulsation only, replaces the previous expansible tumor. This was the history of four of the ten cases now recorded,—that of Kerr, that of Rosenstein, the second case of author's, and the case of Hershey,—and partially so in the case of Barwell, of Roosevelt, and in the first of the author's, all of which latter cases were totally beyond the slightest hope of cure at the time of treatment, as was also the case of Abbe. D. D. Stewart (Brit. Med. Jour., Aug. 14, '97).

Introduction of Foreign Bodies into the Sac.—Catgut, silk, horse-hair, fine wire, especially, have been introduced into the sac to promote coagulation, but this measure does not meet with the approval of the profession.

Moore's method — filipuncture — has proved hurtful or useless in somewhat more than 96 per cent. of the cases. It is not simple or harmless. It is not effective, although sometimes for a brief period apparently so. Verneuil (La Pratique Médicale, July 31, '88).

[Prof. V. Saboia, of Rio Janeiro, used a watch-spring on several occasions with success. J. McFadden Gaston.]

Antyllus's Operation. — The oldest operation is that of Antyllus (fourth century), which was at first employed only for small traumatic aneurisms of the elbow. It consisted in tying the artery above and below the sac, opening the latter, and removing its contents. It was often attended by suppuration, secondary hæmorrhage, and ankylosis, owing to the fact that the artery was tied immediately above and below the sac, the artery being itself diseased in these regions.

In 1710, Anel, believing that the sac would collapse, tied the artery above the aneurism, but the true cause of success in such cases was not discovered until, in 1875, John Hunter proved experimentally that aneurism was not due to localized weakness in the vessel, but to a pathological condition of the arterial wall, extending beyond the sac.

The Antyllus modified operation may be exceedingly difficult, on account of branches springing from the sac, and from the artery above and below the sac being so thickened as to make it almost impossible to tie them. After emptying the sac a probe should, therefore, be passed into the arteries above and below, and the latter only then tied.

When it is too difficult to remove the sac entirely a portion may be left behind.

Hunter's Operation. — In the Anel method the artery was tied too near the sac, where the diseased arterial wall did not allow the ligatures to hold firmly; by Hunter's method the artery is tied at some distance above the sac, where it is healthy. The sac does not collapse; the force of the circulation is simply diminished, allowing the sac and its contents to be absorbed.

Slight œdema of the limb is not a contra-indication for Hunter's operation, but the aneurism should be of slow growth, of moderate size, and the sac not inflamed. It should not be performed in multiple aneurism, except if there are only two, and these can be operated on simultaneously.

This operation may be followed by return of pulsation in the sac, and recurrence, secondary hæmorrhage, inflammation and suppuration of the sac, gangrene, pyæmia, and septicæmia.

In performing Hunter's operation it

is advisable to make distal compression for a few seconds before tightening the ligature, so as to distend the sac, and to ascertain, by digital compression, that the pulsation can be entirely arrested.

A rise in the temperature of the limb is observed after the operation, according to Holmes and Ashhurst. According to the majority of writers, however, the temperature first falls, rising only when the collateral circulation is established.

After the operation two sets of vessels are formed for the collateral circulation, —one around the point tied, the other around the aneurism.

In a very few cases the sac will be obliterated, but a narrow channel will still be left for the passage of the blood. As the aneurism itself has caused previous dilatation of the neighboring vessels, those forming the collateral circulation around the sac develop earlier in cases where two sets develop. If the aneurism be tied near the sac, but one set of collateral vessels is formed.

Secondary aneurism, or pulsation, may occur in from a few hours to several months after consolidation and contraction of an aneurismal sac; but in most cases it forms about twenty-four hours after the new sac, being generally slightly higher up on the artery than the old sac. Recurrent pulsation is due to the upper anastomotic arch allowing too much blood to flow into the artery between the point of ligation and the sac. Though in some cases as distinct as before the operation, it usually consists in a mere *thrill*, without *bruit*.

Pulsation in the sac may also be caused by too rapid collateral circulation being re-established above the sac.

Recurrent pulsation is best treated by raising the limb, compressing the sac moderately, and using cold with care. If this is unsuccessful, the artery may be tied lower down. But, if there is danger of sloughing of the sac, amputation should be performed in axillary or popliteal aneurism, and Antyllus's modified operation in cervical or inguinal aneurism. The prognosis of cases of recurrent pulsation is usually favorable, as it will usually disappear when the sac consolidates. (Ashhurst.)

Secondary hæmorrhage is most likely to take place from the seventh to the fifteenth day, and on the upper than on the lower limb, owing to the more abundant arterial anastomosis on the former. It is favored by the presence of large branches given off close to the point of ligation. Strong, well-prepared, chromicized catgut is less likely to be followed by secondary hæmorrhage than silk.

If after ligation the tumor enlarges, but without pulsation, it is due to blood coming from the artery beyond the sac. The obstruction of the venous circulation caused by this may give rise to gangrene. However, in most cases the blood coagulates, and the aneurism forms a solid fibrinous tumor.

Suppuration and sloughing of the sac after Hunter's operation may be due to recurrent pulsation from want of consolidation due to an imperfectly developed lower collateral circulation, or to total sudden coagulation of the blood in the sac, from complete arrest of the circulation, from violence or handling of the tumor. Death results in about 25 per cent. of the cases where the sac bursts.

Hæmorrhage is most common in cases where recurrent pulsation has occurred; if suppuration is delayed, no hæmorrhage may occur, owing to the arteries communicating with the sac having become sufficiently occluded.

Gangrene occurs usually from the third to the tenth day. It is always moist gangrene, and is most frequent in the lower limb. In some cases it may be prevented by opening the sac and removing its contents in order to relieve the pressure on the veins. When gangrene is really present, the upper limb should be removed at the shoulder-joint, in most cases, and amputation at the junction of the upper and the middle thirds of the thigh, in the lower limb. (Ashhurst.)

Ligation Below the Sac.—Among the methods best known are Brasdor's in which the artery is tied below the sac, thus completely arresting the circulation, and Wardrop's operation, in which the artery or a branch is tied below the aneurism, so as to allow the passage of the blood through another branch or branches, thus only partially arresting the circulation. Brasdor's operation is used in aneurism of the carotid, external iliac, etc., and Wardrop's operation in aneurism of the innominate artery or of the arch of the aorta, where the carotid or subclavian or both may be tied. Ligation below the sac is considered as very unreliable. The sac is likely to increase in size, being still subject to the impulse of the heart.

Extirpation was first proposed in the fourth century by Philagrius, of Macedon.

After cutting down freely upon the aneurism, two ligatures are placed around the artery above the sac, and the artery is divided between them. The sac, with its contents, is then dissected out, and a double ligature is applied to the artery below the sac. The vessel is divided between these two ligatures.

This operation presents certain special advantages over compression, proximal ligation, or other methods,—namely, the permanence of the cure, the absence of secondary hæmorrhage, and the absence of danger of emboli or of infection.

Its mortality, too, is lessened, having been estimated by Delbet at 11 per cent., whereas that of proximal ligation is 18 per cent. Again, gangrene occurs in but 3 per cent. after total extirpation, against about 8 per cent. after proximal ligation.

Extirpation is indicated when the sac has ruptured, when other methods have been unsuccessfully tried, and, above all, in traumatic aneurisms, especially those of the extremities. It is especially indicated in all aneurisms of the forearm and leg, where the sac has ruptured and caused sudden enlargement, and where rupture is impending. It is also recommended in recent traumatic aneurisms, and in arterio-venous aneurisms where operation is indicated.

> [Rose, quoted by Poulet and Bousquet in their "Pathologie Externe," had one death in eight cases, and prefers simple incision to extirpation: a preference in which I concur. J. McFadden Gaston.]
>
> Superiority of extirpation over ligation shown by seventy-six cases treated by incision and extirpation with but one death, against a mortality of 8.3 per cent. with ligatures. The recovery is more complete when extirpation is employed. Pierre Delbet (Compte Rendu Cong. français de Chir., '95).
>
> The return of pulsation and sloughing of the sac are avoided by extirpation. The chances of gangrene not greater than after the Hunterian operation. Extirpation of the sac is the proper treatment for diffuse aneurisms, but in other cases the Hunterian plan is preferred. Ward (Lancet, Nov. 17, '94).
>
> Extirpation is the ideal method. Proximal ligation is to be reserved for cases of idiopathic or spontaneous aneurisms in which the age of the patient or an enfeebled condition would make a prolonged operation hazardous; also when

the position of the tumor precludes the possibility of extirpation. Jos. Ransohoff (Ohio Med. Jour., July, '95).

Extirpation recommended when this operation is possible and easy. Ligation no longer admissible; it exposes the patient to gangrene, rupture, and recurrence, while adhesion of sac to neighboring nerves often causes violent pain. Chaput (Le Bull. Méd., Nov. 24, '95).

Removal of the sac prevents any chance of recurrence of pulsation and extension of the disease. Littlewood (Lancet, Nov. 17, '94).

Statistics of treatment by extirpation: In 1888 the mortality was between 11 and 12 per cent., but in the 76 cases since reported there is not a single death. Of 109 cases treated by simple ligature, 12 had gangrene, while, of the 76 cases extirpated, there were only 7 instances of this accident, and in 4 of these the gangrene existed before the operation. Recurrence is also one of the dangers of ligation, but it is much less apt to take place with extirpation—if, indeed, it is possible. Delbet (La Semaine Méd., Oct. 30, '95).

Literature of '96-'97-'98.

Results of 86 cases treated by extirpation. Of these, 27 were idiopathic, 59 traumatic, 29 occurred in the popliteal artery, 14 in the femoral, and the others were distributed tolerably equally over the remainder of the arterial system. Only 3 deaths ensued: 1 from hæmorrhage during the operation, 1 from secondary hæmorrhage, and 1 after amputation for gangrene. Gangrene occurred in only 2 cases (2.3 per cent.), and secondary hæmorrhage in but 1 (1.1 per cent.). In contrasting this method with others, it becomes evident that the percentage of cases in which gangrene occurs is less than after ligature of the main trunk above, while there is here no possibility of local relapses. The advantages claimed over the old-fashioned method of Antyllus are the following: 1. The length of the after-treatment is immensely diminished, since in many cases it is possible to obtain primary union. 2. The risk of subsequent bleeding is greatly lessened, since all the collateral branches are secured, and it was from these that it usually arose, and not so much from the main trunk. 3. The presence of a thickened cicatrix, which included the doubled-up and wrinkled sac-wall, was likely to lead to interference with the utility of the part, when, as at the knee, the aneurism occurred in the flexure of a limb. Kopfstein (Wiener klin. Rund., Nos. 11-16, '96).

Advantages of excision of the sac of an aneurism over those of distal ligature are: (1) a far greater chance of recovery from the operation; (2) no risk of recurrence; (3) a far less risk of gangrene; (4) a probability of complete recovery from any of the results of nerve-interference. Moynihan (Annals of Surg., July, '98).

Aortic Aneurism.

Symptoms.—Aneurisms may be divided into three groups: (1) those which are entirely latent, giving no physical signs; (2) those giving signs of intrathoracic pressure, but in which the nature of the cause cannot be ascertained; (3) aneurisms which form distinct tumors and give well-marked pressure symptoms and external signs. (Bramwell.)

Aneurisms of the ascending portion of the arch are those most liable to affect the sympathetic. Reflex dilatation of the pupil may thus be caused; the face may be pale. When the cilio-spinal branches are destroyed the pupil is contracted; the vessels of the side of the head may be dilated. Congestion and unilateral perspiration are also, though less frequently, observed.

Tugging on the trachea is a valuable symptom, and may be detected in the following manner: The patient's head being inclined forward to relax the neck, and the cricoid cartilage being grasped between the index and the thumb, the trachea is drawn upward. If an aneurism is present a well-marked ascending motion will be felt at each pulsation.

Ascending motion of the trachea—Olivier's sign—shown in two cases by tracings in the form of slight ascension of a graphic line preceding that of the radial pulse. Cavazzani (Gazetta degli Ospitali, No. 84, '95).

Literature of '96-'97-'98-'99.

Oliver's symptom for diagnosis of aneurism of thoracic aorta, systolic pulsation of the larynx and trachea, is not to be expected in all aneurisms of the aortic arch, but is especially to be observed, either when the aneurism is situated exactly at the intersection of the aortic arch and bronchus or when, if the aneurism is situated at the beginning of the arch, it is adherent to the anterior wall of the trachea. The only other pathological condition which one might expect to produce similar symptoms is a tumor in the anterior mediastinum. This must hold certain relations to the aortic arch, either through pressure exerted by the arch, the tumor is pressed against the bronchus, or it must be adherent to the convexity of the arch and to the trachea. A. Fraenkel (Deutsche med Woch., Jan. 5, '99).

At times a systolic murmur is caused in the trachea by the air being forced out of it during the systole. The sound, however, may also be caused by the sac. It may be heard at the patient's mouth when the latter is well opened. Traction of the tongue causes this symptom to become more distinct.

In two cases a rhythmic shake of the head observed, synchronous with the cardiac systole and due to downward traction of left bronchial tube and trachea by the aneurism at each diastole. Feletti (La Semaine Méd., Nov. 6, '95).

Pain is especially marked in deep-seated tumors. Angina pectoris frequently occurs in aneurisms situated at the root of the aorta.

Cough in thoracic aneurism may be due to bronchitis, or it may be caused by pressure on the trachea. The expectoration is at first abundant and watery; later on it is thick and turbid.

On percussion large aneurisms present abnormal dullness. This dullness is toward the right when an aneurism of the ascending arch is present, and more to the centre and left in those of the transverse arch. Aneurisms of the descending portion of the arch show dullness in the left interscapular region,—*i.e.*, in the space between the spinal column and the scapular border.

A ringing, accentuated, second sound, heard over a dull region, is frequent in large aneurisms of the arch.

Absence of pulse in the abdominal aorta and its branches is observed in cases of large thoracic aneurism.

Inspection is negative in many cases of aneurism of the aorta, but in some abnormal pulsation or a diffuse heaving impulse may be perceived, usually in the first or second right interspace. Throbbing may be seen at the sternal notch or in the neck when the innominate artery is involved. A tumor may be visible in front or in the rear, usually in the left scapular region.

Dyspnœa may be due to compression of the recurrent laryngeal nerves, of the trachea, or of the left bronchus.

Pressure on this nerve, especially on the left one, causes hoarseness and loss of voice. This may be due either to spasm or paralysis of the muscles of the left vocal cord. Abductor paralysis may be the only symptom of aneurism.

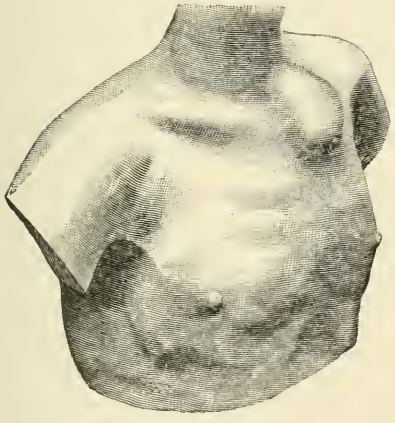
Hæmorrhage from the air-passages may be produced in three ways: (*a*) by the formation of granulation tissue in the trachea where it is compressed, in which case the bleeding is not abundant; (*b*) by the sac breaking into the trachea or bronchi; (*c*) by the lung-tissue being eroded or perforated. A patient may recover and live for years even after pro-

fuse hæmorrhage occurring as the result of aneurism.

A relatively frequent phenomenon is repeated occurrence of hæmoptysis preceding the opening of the sac into the bronchial tubes, due to the existence of a small communication between the aneurism and the latter. Hampeln (Berliner klin. Woch., Dec. 24, '94).

Dysphagia may be due to spasm of the œsophagus or to compression. Perforation may be induced by the passage of an œsophageal bougie. This instrument therefore should not be used.

Ascending Portion of the Arch.—Aneurisms in this region may be situated just above the sinuses of Valsalva, or somewhat higher, on the convex border of the ascending arch. In the former case they may be small and latent, and their rupture into the pericardium (usually causing instant death) be the first indication of their existence. When this does not occur aneurisms in this region may become exceedingly large and project into the right pleural cavity or forward, after destroying the sternum and ribs.



Aneurism possibly arising from one of the pulmonary sinuses of Valsalva. (*Shober.*)

[I witnessed and reported a case in which aneurism of the innominate artery was suspected and in which ligation of the carotid artery was practiced as a last resort, following the use of iodide of potash, digitalis, and continued digital pressure for thirty-six hours and mechanical pressure for one hundred and twenty hours. The patient died immediately upon the ligation of the carotid artery. A post-mortem examination showed that the aneurism was one involving the arch of the aorta and that coagulation had resulted from the pressure, but not sufficient to occlude the vessel. J. McFadden Gaston.]

Literature of '96-'97-'98.

Aneurism probably arising from one of the pulmonary sinuses of Valsalva. Peculiar features noted: development of the sac anterior and to the left of the sternum; the sac fills up a large portion of the upper half of the left thorax; absence of involvement of the vagus and recurrent laryngeal and of the sympathetic nerves; peculiar and unusual murmurs; absence of irregular and asynchronous action of the radial pulses; absence of tracheal tugging.

Points of unusual interest: 1. Two years since the first symptoms appeared; the patient has, during the greater part of the time, been able to be about on her feet, doing light work. 2. Almost entire absence of the usual pressure symptoms. 3. Remarkable result of the therapeutic measures: iodide of potassium, mercurial inunctions, and repeated venesection. 4. Decided benefit gained from venesection. On one occasion, at least, the patient's life was undoubtedly saved by the prompt opening of a vein and the withdrawal of twenty-eight ounces of blood. J. B. Shober (Amer. Jour. Med. Sciences, Feb., '97).

Specimen shown of aneurism arising from behind the aortic valves which projected into the right auricle, where it had ruptured suddenly by a slit-like aperture. The aneurism was the size of a hazel-nut, and two of the aortic valves had been thrown into one, possibly from an old endocarditis. The specimen was obtained from the body of a girl, aged 17, who had no known previous illness, but had died quite suddenly

while walking in the street. E. S. Reynolds (Brit. Med. Jour., Feb. 6, '97).

Remarkable case of aneurism of one of the sinuses of Valsalva met with in a man, aged about 45, found dead. The aneurism bulged into the right auricle and ruptured at a point just above the attachment of the posterior tricuspid segment.

In 1840 Thurman collected 22 cases where aneurism of the aortic sinuses was present. Twenty further cases given. Cottell and Steele (Inter. Med. Mag., pp. 258-263, '97).

The situation of the aneurism with reference to the superior vena cava and subclavian vein causes various accidents. The aneurism may burst into the superior vena cava, or may compress it, causing engorgement of the vessels of the head and arm; or it may compress the subclavian vein, when the right arm is enlarged.

Literature of '96-'97-'98.

Aneurism of the ascending portion of the aortic arch that lead to external rupture. External rupture is one of the more uncommon terminations of a thoracic aneurism. According to Crisp's tables, this occurred six times in one hundred and thirty-six cases of aneurism of the ascending arch which he found recorded. Stewart and Adami (Montreal Med. Jour., Nov., '96).

Case of large aneurism of the arch of the aorta was treated by Macewen's method. The tumor occupied third right intercostal space and was six and one-half centimetres across at its base. At five different times two needles were inserted, and at two other times one needle. The needles were removed one or two days later. The treatment required about two months. No swelling could then be perceived at the level of the tumor. It was almost as hard as bone; percussion gave dullness over the manubrium of the sternum and extending somewhat to its right. A. Bignane (Gaz. degli Osp. et d. Clinic., No. 62, '96).

These aneurisms may affect the right recurrent laryngeal nerve; and also compress the inferior vena cava, which is followed by ascites and œdema of the feet.

Literature of '96-'97-'98.

Point in aortic aneurism emphasized of recent years: the comparatively frequent latency of aortic aneurism, the disease then giving rise to very few or indefinite symptoms. A paralysis of the left vocal cord may constitute the first means of recognizing the aneurism. Auscultation of the upper part of the left interscapular space may reveal an arterio-diastolic murmur not heard elsewhere, or there may be here, or in the neighborhood, a systolic murmur due to the beating of the aneurismal sac on the left bronchus. Gerhardt (Deutsche med. Woch., June 10, '97).

The heart may be pushed down to the left.

Rupture into the pleura or superior vena cava is the usual cause of death, but this may be due to heart-failure or to external rupture.

Literature of '96-'97-'98.

Case of aneurism in a man of 47 who had been an alcoholic and was syphilitic. He had dyspnœa, and, just before admission, a severe chill with intense pain in his left chest. The man was cyanotic, of anxious expression, and had a hacking cough. The left side of the chest showed the evidence of pleural effusion. The heart reached over to the right mammillary line, but the left border could not be outlined. There was a slight murmur, and the second pulmonary sound was accentuated. The liver was enlarged. The left pleural cavity was punctured, and fluid was withdrawn, but patient died. There was no real evidence of aneurism until the bloody fluid was withdrawn from the pleura. Heart was but moderately enlarged, and had been greatly displaced to the right. The left pleural cavity contained a gallon of blood. Aorta presented an opening in its anterior wall, below the level of the left bronchus. This

led into the aneurismal sac, which was about the size of an egg. It opened into the posterior mediastinum and here was a second false sac lined by the pericardium and the right and left mediastinum walls. Pius Renn (Med. Rec., Sept. 10, '98).

Transverse Arch.—Three varieties of aneurism are observed in this location. In the first and most common form the aneurism is small and not visible externally. The growth is directed backward or downward and may involve the œsophagus, causing dysphagia. The trachea may also be pressed upon, giving rise to cough, which is often paroxysmal The left recurrent laryngeal nerve may also be compressed as it passes around the arch of the aorta or a bronchus. In the latter case bronchiectasis, bronchorrhœa, and suppuration into the lung. not uncommonly the cause of death, may result.

The second variety of aneurism of this class is that in which the mass may project forward and simulate a large tumor. It may destroy the sternum and penetrate the opening thus created.

In the third class the aneurism may grow on both sides into the pleura between the sternum and vertebral column. This form may last for years. The carotid (radial pulse) may be affected by the involvement by the sac of the innominate artery, or more rarely the carotid and subclavian arteries.

Compression of the thoracic duct, an occasional complication, may finally induce inanition. When the compression includes the sympathetic nerve, there is. at first, dilatation of the pupil; this may be followed by paralysis, with contraction of the pupil. Pressure of the vertebræ may cause severe pain; of the œsophagus, dysphagia; of the lungs or bronchi. bronchiectasis. the retention of pulmonary secretions giving rise to fever.

Most are saccular; some are small and spring from the aorta just above the aortic ring. Another variety springs from the anterior and upper aspect of the aorta in the form of large tumors, or from the descending aorta and the lower surface of the arch, compressing the trachea or bronchi.

In intrathoracic aneurism clubbing of the fingers and incurving of the nails of one hand may also be observed, even when no venous engorgement is present.

Literature of '96-'97-'98.

Remarkable series of aneurisms of the aorta in a man 73 years of age. No complete physical examination made before his death. At the autopsy, occupying the normal position of the heart and pushing forward the parietal pleura in that region, was a rounded tumor, the size of a large orange. The left lung was completely collapsed and its apex converted into fibrous tissue. The aorta, from its beginning to its passage through the diaphragm, was enormously dilated and converted into a series of irregular pouches, the largest being ten centimetres in diameter. About twenty centimetres from the aortic valve, in the upper part of the descending aorta, was a transverse linear rupture, about three centimetres long. The sac contained, for the most part, fluid blood. The dilatation of the aorta continued down to within about six or seven centimetres of the bifurcation. The intima of the aorta everywhere was the seat of atheroma and calcareous deposits. Connor (Med. Record, Nov. 6, '97).

Sudden death may be induced by rupture into the pleura or a small and latent aneurism bursting into the œsophagus. The spinal cord may be compressed and give rise to disorders of locomotion.

Differential Diagnosis. — When the aneurism is in the thorax, the conditions with which it may be confounded are:—

1. Violent throbbing of the arch through marked aortic insufficiency.

2. Displacement of the heart through the deformity caused by spinal curvature.

3. Pulsating pleurisy can be differentiated by means of a fine, hypodermic needle. In pulsating pleurisy the throbbing is usually wide-spread and diffuse; in aneurism there is a firm, heaving distension and a diastolic shock.

4. Tumors. In deep tumors the pain is likely to be more severe. Pressure phenomena are most common in aneurism. When the abdominal aorta is involved, neurotic pulsation of the latter should be suspected.

Abdominal pulsation met with in some women should be differentiated from that of aneurism. Pain, thrill, and an increasing tumor in the latter are symptoms which cannot be perceived in the former. Goodell (Med. and Surg. Reporter, Mar. 24, '88).

Literature of '96-'97-'98.

Two cases in which early diagnosis of aortic aneurism with the aid of the x-rays was established. In one case there was paralysis of the left cord with hoarseness. The x-rays showed that the area corresponding to the cardiac dullness was more extensive than usual in the neighborhood of the third rib in front and the fourth rib behind. Marked pulsation was noted in the shadow behind. In the second case, the patient complained of a slight hæmoptysis, and paralysis of the left cord was discovered. No other sign or symptom of aneurism was present. The x-rays revealed a pulsating protuberance from the aorta in the neighborhood of the second rib and confirmed by subsequent examinations. The x-rays should prove to be an extension of our means of early diagnosis. Aron (Deutsche med. Woch., May 27, '97).

Almost none of the symptoms are due to the aneurism itself, but most are produced by the influence of the tumor upon neighboring structures. A certain amount of dull pain may be due to the distension of the sac-wall itself; but this is usually entirely overshadowed by that produced by alterations in parts in the neighborhood. For our diagnosis we must depend not so much upon the physical signs of an arterial tumor as upon those due to an abnormal growth of whatever nature.

The typical signs of aneurism may be said to be tumor, expansile pulsation, thrill, bruit, and shock. Tumor is frequently absent; expansile pulsation is, in many situations, impossible of detection; thrill is a very uncertain sign; bruit is as often absent as present; while shock, whether diastolic or systolic, is frequently absent. F. A. Packard (Mass. Med. Jour., Oct., '97).

Radioscopy is of value in the study of aneurisms of the arch of the aorta, but of little use in case the descending aorta is affected, as under the latter conditions the shadow of the heart overlies that of the aneurism. G. R. Murray (Practitioner, Feb., '98).

Etiology.—Aortic aneurism is especially due to alcohol, syphilis, and overwork. Sudden muscular exertion may lacerate the media. The etiological factors of aneurisms in general may all be considered as capable of promoting aneurism of the aorta.

Treatment.—All methods should be aided by rest in bed and proper diet.

It is unnecessary to give large doses of potassium iodide,—viz., from 10 to 20 grains thrice daily. This drug relieves pain, causes thickening and contraction of the sac, and lowers the blood-pressure. Pain may sometimes be relieved by anodyne plasters or embrocations, but morphine may be necessary in the final stages. Ice poultices, recommended by some to relieve pain, are liable to cause gangrene of the skin, owing to deficient circulation. Chloroform may be used in dyspnœa. Small, but repeated,

venesections are highly recommended for the latter symptom.

Frequently repeated venesections to relieve acute symptoms employed successfully in nine cases. Pitt (Brit. Med. Jour., Apr. 8, '93).

Venesection—removal of from 27 to 30 ounces—followed by great relief from paroxysmal dyspnœa and from pain, lasting nine months in one case. One copious venesection recommended. Davison (Lancet, May 19, '94).

Tracheotomy may be useful when dyspnœa is due to bilateral abductor paralysis, but not when it is due to compression at the bifurcation, which is almost always the case.

Where external rupture of an aneurism is feared hemlock or lead plaster may be used as a support. (Ashhurst.)

Laceration of the media frequently occurs in the ascending portion of the arch previous to the occurrence of compensatory thickening. (Osler.)

Tufnell's treatment of restricted diet and rest in bed has given satisfactory results.

If the milder methods do not succeed needling should be tried, aided by distal compression, when feasible, during the use of the needles; if this fail, distal ligation should be resorted to. (Nancrede.)

Case of aneurism of the ascending aorta. Two Macewen needles inserted and allowed to remain for twenty-four hours, repeated four times. Satisfactory results. Bignone (Riforma Medica, Mar. 1, '95).

Case treated by means of Macewen's needles; no improvement. Robert F. Weir and Emmett D. Page (N. Y. Med. Jour., May 7, '92).

Literature of '96-'97-'98.

In treatment of aneurism of aortic arch following conclusions reached: 1. The remedy lies within the domain of surgery. 2. There are but two such methods at the present time to be considered: (*a*) obstruction of the right subclavian and common carotid arteries; (*b*) introduction of wire or needles into the sac, with or without galvanism. 3. Either one or both of the operations should be applied in all cases after a thorough saturation with the iodides. 4. Ligation is attended by less danger, less mortality, greater and more permanent and universal benefit. B. Merrill Ricketts (Jour. Amer. Med. Assoc., Aug. 13, '98).

In these cases graduated exercise, baths, and the Schott method, with a suitable dietary, sometimes afford marked relief.

Literature of '96-'97-'98.

Case of aneurism of the aorta treated by mineral baths and graduated walking exercise, with a liberal nitrogenous dietary and free ingestion of fluids to eliminate uric acid, etc. After six weeks the patient could walk with comfort during three hours a day. A sciagraph showed that there was no increase in the size of the aneurism in spite of the exercise. Recurrence of the symptoms promptly yielded to the same treatment. Bezly Thorne (Brit. Med. Jour., Mar. 6, '97).

Aneurism of the aorta treated by baths on the Schott principle. General condition much improved. (Glasgow Med. Jour., Apr., '96.)

In this form of aneurism favorable results are sometimes obtained by the introduction of foreign bodies.

Fifteen cases of aortic aneurism in which, when practicable, introduction of silk-worm gut was resorted to. In one case the gut-fibres were absorbed after the desired effect had been produced. Von Schrötter (Inter. klin. Rund., Nov. 26, '93).

Aneurisms of the thoracic aorta may be most safely attacked, after medical treatment has failed, by introduction of small quantity of inelastic wire. Bristow (Brooklyn Med. Jour., Oct., '95).

Cases of aneurism of the arch in which the introduction of silver wire was tried with no effect. Jelks (Medical Age, July

10, '93); Stewart (Brit. Med. Jour., Jan. 14, '93); Baccelli (Le Progrès Méd., July 29, '93).

In 1895 Dastre demonstrated that the injection of a solution of gelatin into the veins of a dog rendered the blood more coagulable. This discovery has recently been utilized in the treatment of aneurism of the first portion of the arch of the aorta.

Literature of '96-'97-'98.

Case of a man, aged 46 years, who had a large aneurism undoubtedly due to a malarial aortitis, which had eroded the second, third, and fourth right cartilages, the extremities of the corresponding ribs, and a large portion of the sternum. On the surface of the tumor there were patches of ecchymosis which were soft and depressible, and in the neighborhood of which the blood was directly in contact with the very thin skin. On January 20th 13 drachms of a 1-per-cent. sterilized solution of gelatin in a 0.1-per-cent. solution of sodium chloride was injected into the subcutaneous tissue of the left buttock. The solution was injected at a temperature of 98.4° F. There was a slight reaction following this injection. During the following days the tumor became somewhat diminished in volume and the pains completely disappeared; but soon the tumor returned to its former dimensions, the walls again became soft, and the intercostal pains returned. On February 10th a second injection of 5 ounces of a solution similar to that first employed was given. This solution was followed by results similar to those which followed the first injection, except that there was no reaction. Since that time twelve injections similar to the second have been made at intervals of from two to five days. The tumor diminished in volume (one inch in the vertical and one-half inch in the transverse diameter). It is very firm, and, although on palpation a pulsation can be felt, that pulsation is not expansile, but is transmitted from the aorta. The pain entirely disappeared. Lancereaux (Gaz. des Hôp., June 24, '97).

Carotid Aneurism (in the cervical region).

Symptoms.—Aneurism of the carotid artery usually occurs where the common carotid bifurcates into the internal and external carotid arteries. On the right side it most frequently appears where the artery springs from the innominate artery. Its special symptoms are dyspnœa, difficulty in swallowing, hoarseness, a brassy cough, vertigo, and tinnitus aurium.

Carotid aneurism first appears as a small tumor, which may grow very rapidly.

Literature of '96-'97-'98.

Case in which the patient, a woman 37 years of age, had been advised to seek mechanical treatment for spinal disease. The principal symptoms were radiating pain in the back, loss of flesh, aphonia, and occasional dyspnœa. Examination revealed a pulsating tumor at the lower part of the carotid triangle and a decided aneurismal bruit. Ketch (Amer. Pract. and News, May 1, '97).

Case of aneurism of the internal carotid following scarlet fever in a girl, aged 18 years, severe inflammation of the throat being a prominent symptom. A month after the onset the aneurism appeared in the left sterno-mastoid region, immediately below the mastoid. It was the size of a walnut, reducible, and pulsating energetically. On exploratory puncture with a Pravaz syringe blood was obtained. No treatment was employed. Gradual improvement took place, and the patient spontaneously recovered in three months. Lyot and Retit (Revue des Sciences Méd., July, '97).

Differential Diagnosis.—At the root of the neck it is sometimes difficult to ascertain whether the carotid alone is involved. Aneurisms of the subclavian, the innominate, and the aortic arch may simulate those of the carotid when these are close to the clavicles.

Enlarged cervical glands may be taken for aneurism; but, as these are usually multiple and not endowed with powers of auto-expansion, their diagnosis is easily established. Cysts and vascular growths of the thyroid resemble aneurisms in some cases. Cysts in the cervical region are very rare, while any growth connected with the thyroid gland follows the movements of the latter during deglutition.

Abscess may be taken for aneurism, especially cold abscess, but the cachectic facies is different, and the growth, though pulsatile through the pressure upon the underlying large vessels, is not expansile. An ordinary abscess can easily be recognized by its characteristics, which differ entirely from those of aneurism.

Prognosis.—Spontaneous cure is rarely observed. The usual course of an aneurism is to progress until rupture into the pharynx or trachea or externally takes place. Some cases remain dormant for a long while, and suddenly undergo the process of development.

Treatment.—All methods should be supplemented by recumbency and diet. Proximal compression, when feasible, should always be tried, and, where the arterial coats are seriously diseased, should supersede ligation. Needling should supplement pressure when the case is progressing rapidly. Possibly it is advisable in all cases suitable for compression, and is certainly to be employed where this method fails in cases with highly atheromatous vessels. Proximal ligation, having been rendered much safer of late by the use of aseptic precautions, less-absorbent ligatures, and the avoidance of all injury to the arterial walls by employing the stay-knot, is permissible when the arterial walls are relatively sound, until experience decides whether or not needling is clearly indicated. Since recurrence after proximal ligation almost certainly results from non-deposition of white thrombi and their maintenance in contact with the aneurismal wall from lack of proper changes of its lining, needling is clearly indicated. Where the location prevents proximal arrest of the blood-current, needling is the best operation; possibly distal compression — rarely feasible — might aid in the deposition of thrombi. For the reasons already given, although occasionally successful, the indications for the permanent introduction of such foreign bodies as wire, horse-hair, etc., into aneurismal sacs are so much better met by needling that such procedures had better not be adopted. The modern revival of the older method of extirpation of aneurisms should not be attempted for spontaneous cervical aneurisms. (Nancrede.)

Literature of '96-'97-'98.

Successful treatment of case of circumscribed traumatic aneurism of the right internal carotid artery within the cranium by means of ligature of the common carotid. Hinde (Jour. Amer. Med. Assoc., Dec. 4, '97).

Case of carotid aneurism that was cured in an unintentional and unexpected way by manipulation. The attending physician, wishing to illustrate to the patient the effects of ligation, the treatment that was advised, pressed firmly over the sac and artery. Within two days a clot formed, pulsation had ceased altogether, and in a short time there was not the least vestige of the aneurism, and the patient was able to return to his occupation. R. Slocock (Lancet, Nov. 26, '98).

Extirpation of an aneurism of the carotid may, however, be followed by good results, even when the common carotid is involved.

The treatment most generally em-

ployed, if there is room, is to tie the artery between the sac and the heart, and, if there is not room enough, beyond the sac. This may, however, be followed by embolism, cerebral softening, hemiplegia, syncope, or by secondary hæmorrhage or suppuration.

More than one-third of the deaths following ligation of the common carotid are due to subsequent cerebral disease.

Cerebral softening following ligation of the common carotid, due to embolus, is mainly caused by the arrest of the blood-current. Besides the trunk of the common carotid, the internal carotid should also be ligated, to prevent the return-current, which takes place from the internal to the external carotid. Lampiasi (La Semaine Méd., Nov. 11, '91).

Extirpated aneurism of the external carotid. (*Delagénière.*)
(Archives Provinciales de Chirurgie.)

Ligation of both common carotid arteries, at a year's interval; neither operation followed by brain symptoms. Gay (Boston Med. and Surg. Jour., Mar. 8, '94).

When both carotid arteries must be tied, it should not be done at the same time, as fatal coma has followed a simultaneous operation.

Gentle handling of cervical aneurisms recommended to avoid the dislodgment of coagula through the internal carotid. Case in which a rough manipulation was followed by immediate paralysis. Hulke (Inter. Med. Mag., Dec., '92).

Subclavian Aneurism.

Symptoms.—Aneurism of the subclavian attacks more especially the third portion of the artery, appearing as an elongated tumor beneath the clavicular insertion of the sterno-cleido-mastoid.

The special signs of subclavian aneurism are a varicose condition of the jugular veins, a retarded pulse at the wrist, œdema of the arm and hand, pain in the nerves of the brachial plexus, and, if the aneurism is on the right side, a brassy cough from irritation of the recurrent laryngeal nerve. Two-fifths of the deaths following ligation of the third part of the subclavian are due to intrathoracic inflammation.

Diagnosis.—Aneurism of the subclavian artery in its third portion is to be distinguished from carotid aneurism. In the former the pulse at the wrist is found delayed when compared to the pulsation of the carotids.

When both the carotid and radial pulse on the right side are delayed as compared to the left carotid artery, aneurism of the innominate artery is to be suspected.

Treatment. — Medical treatment of subclavian aneurism should precede all other methods. Ligature of the innominate, when supplemented with simultaneous and consecutive ligature of the associated contiguous arteries, or by other expedients equally well intended to aid the cure, is worthy of favorable consideration. (J. D. Bryant.)

Pressure applied by the finger between the aneurism and the heart, supplemented with general measures, has been tried in cases in which the tumor was small. This procedure is not easy, however, on account of the anatomical constitution of the region and has been re-

placed by direct pressure upon the sac proper.

When compression is unsuccessful the artery may be tied beyond the aneurism. Ligation between the latter and the heart has rarely succeeded.

Study of one hundred and fifteen operated cases of subclavian aneurisms. Deductions as to treatment: Strict asepsis the sheet-anchor. The best plan is to ligate the first portion of the subclavian with a double or, better, triple, non-contiguous, absorbable ligature, without rupturing the coats. When it is decided to ligate the subclavian and the common carotid in one operation, it is best to first ligate the subclavian. In idiopathic aneurisms the defective general condition of the patient should be borne in mind. Souchon (Annals of Surg., Nov., '95).

Simultaneous ligation of the common carotid and subclavian arteries recommended. The larger the aneurism the greater the development of collateral circulation. Guinard (Bull. Gén. de Thér., Jan. 13, Feb. 15, 28, '94).

Simultaneous ligation of the right common carotid and right subclavian or axillary artery appears to be the operation of choice. Statistics showing six cures and twenty-two improvements out of fifty-six cases. Toivet (Revue des Sciences Médicales en France et à l'étranger, Jan. 15, '94).

Method of controlling the circulation in the upper extremity by elastic compression. A wooden pad is placed over subclavian and held in place by the rubber bandage of the Esmarch apparatus; the bandage carried from the chest over the back and then alternately between the thighs and under the opposite axilla. W. W. Keen (Med. and Surg. Reporter, June 27, '91).

Successful ligation of the first portion of the left subclavian artery and excision of a large subclavio-axillary aneurism, probably the only successful case of this kind and the first one of complete extirpation of a subclavio-axillary aneurism. Halsted (Johns Hopkins Hospital Bulletin, July, Aug., '92).

Literature of '96-'97-'98.

Case of a man, aged 55, with aneurism of the first part of the right subclavian artery, involving probably also the terminal portion of the innominate artery. The aneurism was as large as half a lemon. The right common carotid and the first part of the right axillary arteries were tied at the same time with ordinary catgut ligatures five weeks ago. Pulsation diminished and the swelling lessened from the hour of the operation, and at present time a small, hard, flat tumor no larger than half a walnut is all that remains. No cerebral or other untoward symptoms followed the operation, and both wounds healed firmly within a few days. Jordan Loyd (Birmingham Med. Rev., May, '98).

Case of left subclavio-axillary traumatic aneurism; ligation of subclavian artery in its second part; recovery, with perfect use of arm. Croly (Med. Press and Circ., Feb. 16, '98).

Axillary Aneurism.

A peculiarity of this form is its rapid growth. Being surrounded by lax tissues, it develops very quickly and is soon of considerable size. The same anatomical feature causes the sac to be easily inflamed, its location tending to assist this by the exposure to traumatism, pressure, etc.

Pain is usually a prominent symptom, owing to pressure on the nerves of the brachial plexus. Œdema of the forearm usually follows the venous obstruction induced by pressure of the aneurism on the venous trunks. The pulse at the wrist is slower than that of the opposite side.

An axillary aneurism may compress the lung, causing dry pleurisy or hyperplastic pneumonia, or may erode the ribs. It may invade the shoulder-joint, interfere with the motion of the arm, and cause ankylosis.

Traumatic axillary aneurisms are

caused by a wound, an attempt to reduce an old dislocation, etc.

Etiology.—Aneurism of the axillary artery is sometimes traumatic. At other times it may be due to elongation of the artery by too free motion of the shoulder-joint, or to stretching during the reduction of an old dislocation, especially when the vessels are atheromatous.

Case of axillary aneurism caused by the pressure of a crutch. Bardeleben (Berliner klin. Woch., Dec. 16, '89).

Literature of '96-'97-'98.

Case of axillary traumatic aneurism caused by the jamming of a pair of scissors up into the axilla, making a punctured wound about 1 inch in depth. The aneurism consolidated spontaneously and was almost entirely absorbed. This result was probably induced by elevation of the arm, with the patient in the recumbent position. Willett (Practitioner, Dec., '98).

Prognosis.—Spontaneous cure of these aneurisms is very rare. The sac, if allowed to do so, rapidly becomes larger and ruptures into the surrounding cellular tissue, the shoulder-joint, or the thorax.

Treatment.—Compression of the third portion of the subclavian may be first tried, with or without an elastic bandage applied to the arm. Compression is usually very painful. Should these methods fail, the third portion of the subclavian may be tied.

The most satisfactory treatment in general is to ligate the subclavian as far away as possible, dividing the scalenus anticus. When the incision involves considerable tissue the phrenic nerve should be watched for, and pushed aside if met. Collateral branches of the artery should also be tied to diminish the risk of secondary hæmorrhage.

Cases of axillary aneurism, with successful ligation of subclavian artery. Neugebauer (Centralb. für Chi., Aug. 17, '95); Horwitz (Ther. Gaz., May 15, '95); W. E. Waters (Medical Record, May 25, '95).

The treatment of traumatic aneurism should consist in arresting the circulation by pressure on the third portion of the subclavian, opening the sac, and removing its contents. The wound in the artery should then be found and the artery divided at that point, both extremities being tied.

Brachial.

Brachial aneurism is usually traumatic in origin. Venesection, carelessly performed, occasionally causes aneurismal varix or varicose aneurism at the bend of the elbow.

Aneurism half the size of an orange in the bend of the elbow, subsequent to venesection, cured by ligature of the brachial artery in middle third. Gallo (Le Dauphiné Méd., Mar., '94).

Case diagnosed as a neuroma of median nerve found, on exposing swelling, to be a cured traumatic aneurism of the brachial artery. On account of excruciating pain artery cut above and below aneurism and sac dissected out. Bland Sutton (Med. Press and Circular, Sept. 26, '94).

Idiopathic brachial aneurism may be treated by Hunter's method, by the modified method of Antyllus, or by compression. In either of these, however, gangrene of the forearm is a possibility. When this complication occurs, amputation becomes necessary.

Abdominal Aorta.

Symptoms.—Aneurism of the abdominal aorta is uncommon, as compared to that of the thoracic aorta. It usually occurs near the cœliac axis, where it may form a fusiform, sacculated, or multiple tumor; this may project backward, and either erode the vertebræ, causing subsequent numbness and ting-

ling in the legs, which may be followed by paraplegia, or it may burst into the pleura.

This form of aneurism, however, usually projects forward either in the middle line of the abdomen or somewhat to the left. If it is located high up, and under the pillar of the diaphragm, it may be beyond the reach of the hand in palpation.

There usually are disorders of digestion, especially vomiting and pain, the latter frequently simulating cardialgia. It may be located either in the back or resemble girdle pains, passing around the sides to the back.

Literature of '96-'97-'98.

Case of aneurism of the abdominal aorta, with symptoms of renal colic. Cheadle (Lancet, Nov. 20, '97).

A distinct tumor is generally visible in the epigastric region. Locally, pulsation may be detected, while a thrill may frequently be observed when the hand is applied over it.

Palpation usually reveals the presence of a definite tumor, showing a strong expansile effort; the pulsations may be double in character when the aneurism is large and brought in contact with the pericardium.

Percussion may elicit a certain amount of dullness, usually intermingling with the dullness of the left lobe of the liver.

Auscultation will usually reveal a systolic murmur, and at times a very soft diastolic murmur. The former is frequently best heard by auscultating behind, near the spinal column.

Differential Diagnosis.—A throbbing aorta is frequently mistaken for an aneurism. An abdominal aneurism should not be declared present unless a definite expansile, pulsatile, and graspable tumor can be felt, notwithstanding the presence of a forcible pulsation, a thrill, or a systolic murmur.

Tumors of the left lobe of the liver, of the pancreas, and of the pylorus may all be influenced by the movement of the aorta and suggest aneurism, but there is no expansile action in tumors, and, if the patient be placed in the knee-elbow position, the pulsation will usually not be felt, owing to the tumor falling forward by its weight and thus being no longer in contact with the aorta.

Prognosis.—The prognosis is unfavorable, although a few cases of spontaneous recovery have been observed.

Death may be due to compression of the spinal cord; paraplegia and its results; to embolism of the superior mesenteric artery followed by infarction of the bowels; to the aneurism bursting into the retroperitoneal tissues, the peritoneum, or the intestine, usually the duodenum, or into the pleura; or finally to the abdominal aorta becoming obliterated by clots. (Osler.)

Treatment. — The treatment of abdominal aneurism is the same as that of aneurism of the thoracic aorta.

Pressure of the aorta above the sac has been successfully tried in a case where the aneurism was localized low down; but it should be remembered that traumatism of the sac has caused death in similar cases. Should this treatment be selected the pressure should be continued for many hours, under chloroform.

Case of aneurism of the abdominal aorta causing death by rupture into the stomach. Great danger of the administration of ergot in aneurisms, greatest in cases where the walls of the sac were more than ordinarily attenuated, or where the tendency to atheroma was marked. Ridley-Bailey (British Med. Jour., July 11, '91).

Literature of '96-'97-'98.

Case of aneurism of the abdominal aorta cured by 5-grain protonuclein tablets, one every two hours. Theodore J. Yager (N. Y. Med. Jour., Sept. 10, '98).

Case in which aneurism of abdominal aorta was exposed by a free abdominal incision, and a hollow, gold-tipped needle inserted into the sac. Through this was passed eight and one-half feet of No. 30 gold wire, which was connected with the positive pole of the battery; a clay plate placed under the buttocks was connected with the negative pole. The current was gradually increased to 70 milliampères during half an hour. The pulsation in the tumor lessened, but the patient became collapsed and cyanosed, reviving, however, later under stimulant treatment. The wire was left in the sac, and the wound closed. Patient died six months later from some other affection, but there was no recurrence of the aneurism. Of 11 other cases treated in this way by other surgeons, 4 resulted in apparent cure and 6 improved. W. H. Noble (Phila. Med. Jour., June 25, '98).

Iliac Aneurism.

An aneurism may form on either the common, internal, or external iliac arteries or one of their branches, and be, as in other regions, idiopathic or traumatic. In the latter case, however, the external iliac is almost always the portion involved.

Symptoms.—The enlargement appears as a circumscribed swelling in the line of the vessel, presenting the characteristic expansive pulsation and bruit along its course. If the genito-crural is pressed upon, pain may be a prominent feature of the case. Owing to the ease with which the surrounding organs may gradually be displaced, however, the aneurism attains a large size before it is discovered. Œdema and gangrene sometimes result from the pressure induced on venous trunks. If left to itself an iliac aneurism usually ruptures.

Differential Diagnosis.—Enlarged glands near Poupart's ligament may simulate an iliac aneurism. The glands are not pulsatile and cannot be emptied by pressure, while no bruit can be detected. Tumors and abscesses may be differentiated in the same way.

Treatment.—Aneurism of the *common iliac* artery is best treated by compression above the aneurism, as little as possible over the sac. A mortality of almost 75 per cent. is found as a result of ligation of the common iliac for aneurism.

If the aneurism be one of the *internal iliac* and idiopathic, pressure may be applied above it, and, in non-success, coagulating injections, or even ligation by a median laparotomy may be resorted to. If the aneurism is traumatic, the artery should be compressed above the aneurism, the sac incised, and the artery tied above and below the wound.

When dealing with the *external iliac* artery and the aneurism is idiopathic, compression should be first tried, followed in case of failure by ligation above the sac. This operation may be performed by a median laparotomy. The modified operation of Antyllus should be used if the aneurism is traumatic.

Case of successful extirpation of an aneurism of the right external iliac artery, occupying whole right iliac fossa and as large as the head of a child at term. Recovery uneventful, and patient following his occupation as a clown. Quénu (Le Bull. Méd., Dec., '94).

Forcible flexion of the hip-joint kept up for several hours; five days later aneurism retracted to one-fourth its original size. Fifteen days afterward patient left the hospital. Ganoza (La Crónica Médica, Dec., '93).

Case of large ilio-femoral aneurism. Ligation of external iliac artery. Patient up by the forty-seventh day. Three months later aneurism in opposite groin. Operation repeated; recovery much more rapid than on first occasion, collateral

circulation being established more promptly. Patient a carpenter. Makins (Brit. Med. Jour., Nov. 30, '95).

Literature of '96-'97-'98.

Case of transperitoneal ligation of the external iliac artery for aneurism, in which secondary cœliotomy for intestinal obstruction was performed. Recovery. John C. Davie (Brit. Med. Jour., Apr. 11, '96).

Case in which transperitoneal ligation of the external iliac artery for femoral aneurism was performed with subsequent dissection of the sac. Recovery, but with complete paralysis of sensation over the anterior aspect of the thigh and inability to extend the leg on the thigh, probably due to section of some branches of the anterior spinal nerve while laying the sac open. N. P. Dandridge (Med. News, Apr. 3, '97).

Two cases of ligature of the external iliac artery for aneurism by the transperitoneal method. The transperitoneal operation has many advantages over the older operation, provided strict cleanliness is maintained. In both cases the ordinary operation would have been difficult, if not impossible, owing to the position of the swelling. W. H. Brown (Lancet, Oct. 23, '97).

The following conclusions offered as fundamental rules to be observed in the treatment of ilio-femoral aneurism: Whenever possible, compression should be given a trial before resort to more severe measure. If compression fails, operative procedures are then indicated, and, when feasible, total extirpation of the sac should be chosen as the surest. These rules are especially applicable to ilio-femoral aneurism, but they are equally so to aneurisms of other portions of the body, if they are so situated as to allow of operative treatment. F. Schops (Wiener klin. Woch., Nov. 24, '98).

Case of aneurism of uterine artery cured by ligation of internal iliac artery. Patient was originally operated on for a pelvic abscess, which was opened through the vagina. The incision was followed by copious venous hæmorrhage. On examination there was found "a softly elastic, strongly pulsating, and thrilling tumor of about the size of a hen's egg, projecting into the left vaginal vault, close to the cervix and extending slightly down on the left vaginal wall." An incision was made in the left semilunar line and the internal iliac artery was isolated and tied. Pulsation, all but a slight transmitted movement, entirely stopped in aneurism and the patient made a good recovery. In order to doubly insure a cure galvanopuncture was practiced twice, with noticeable benefit. Paul F. Mundé (Med. Rec., Dec. 31, '98).

Femoral Aneurism.

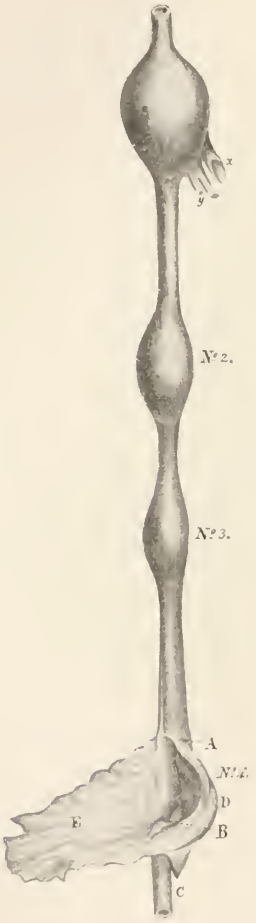
Symptoms.—The femoral artery is frequently the seat of traumatic aneurism on account of its exposed position. It may involve the common, the superficial, or the deep. It is generally sacculated. In some cases it is fusiform or flattened, as in Hunter's canal.

Case of aneurism of terminal end of femoral artery; tumor composed of two parts,—one, a cyst, with thick wall, filled with brownish fluid; the other, situated below the first, consisting of a series of small, irregular cavities filled with arterial blood from the deep femoral. Israel (Berliner klin. Woch., Oct. 28, '95).

Differential Diagnosis.—The difficulty here lies in recognizing whether the dilatation is on the superficial or the deep branch, the other characters peculiar to an aneurism being easily determined. The superficial branch is that most frequently affected, and the arterial pulsations below are more affected by it than by an aneurism of the superficial branch. The bruit of aneurism in cases where the femoral or popliteal artery is the seat of the lesion may frequently be made more distinct by placing the patient in the recumbent position and elevating the limb.

Case of double aneurism of left thigh, —one, the size of an egg, at Scarpa's triangle; the other, as large as a cocoa-nut, at the opening through the abductor

magnus. Superficial femoral ligated in middle of Scarpa's triangle, suppuration and two secondary hæmorrhages ensuing; wound enlarged and bleeding ends tied. Only one case on record of cure of double aneurism of superficial femoral artery by operative procedure. Souchon (N. Y. Med. Jour., Nov. 2, '95).



Case of multiple aneurism. *No.* 1, "Inguinal" aneurism; *No.* 2, Femoral aneurism; *No.* 3, Small aneurism, which had not been discovered during the patient's life; *No.* 4, Popliteal aneurism, which ruptured; *A*, Orifice of femoral artery; *B*, Inferior orifice of same; *C*, Continuation of popliteal; *E*, Aneurismal sac. (*Monro.*)

Treatment.—In idiopathic aneurism of this artery digital or instrumental compression above the sac is to be preferred. If this proves unsuccessful, ligation is to be resorted to. If the aneurism is in Hunter's canal, the artery should be ligated above; if it is in Scarpa's triangle, ligation of the common femoral gives the best results, although ligation of the external iliac is usually preferred, owing to the absence of branches where the ligature is usually applied.

[An instructive case of double aneurism of the femoral and popliteal occurred in my practice in 1887, a full report of which appeared in Gaillard's Medical Journal.

It occurred in a mulatto about 40 years old. Persistent digital compression was tried over the artery in Scarpa's triangle and also over it as it passes out of pelvis on the pubic bone. Relays of students were used for this purpose. No effect, though this was kept up for forty-eight hours.

It was afterward determined to ligate the femoral in Hunter's canal, with a view to obliterate the popliteal aneurism, and the external iliac midway between the pubic bone and the anterior superior spine of the ilium.

It is inferred that, while the compression accomplished no radical result, it favored the development of collateral circulation, and thus conduced to the good result of the ligation. The immediate result of the ligation upon the femoral, upon the principle adopted by Hunter, was to obliterate the flow of blood in the popliteal region, and to lead ultimately to its disappearance. There was no evidence of material interference with the nutrition of the foot and leg after the ligation of the femoral; but, after the ligation of the external iliac, it was necessary to keep up warmth in the limb by the application of cotton batting to the limb and the use of hot-water bottles, and ultimately there was exfoliation of the cuticle of the foot, but no sloughing or gangrene of the tissues. The final effect of the opera-

tion was entirely satisfactory in the disappearance of the popliteal and femoral aneurisms and the restoration of the function of the limb. The experience in this case would tend to show that compression should be used only in cases where the cardiac side can be reached, and that with caution. J. McFadden Gaston.]

In traumatic aneurism of the femoral the artery should be compressed on the edge of the pelvis by means of a tourniquet, the sac opened, and both ends of the divided artery tied.

Case in which forced flexion, graduated compress, shot-bag, and three-pad tourniquet tried without success. Femoral artery tied at the apex of Scarpa's triangle, the stay-knot of Ballance and Edmunds being used. Discharged in three weeks. Keen (Annals of Surg., Dec., '95).

Case of femoral aneurism due to a kick in the groin. External iliac ligated, using Ballance and Edmunds's "stay-not"; eventual sloughing of anterior tibial muscles; amputation. Aneurism now quite solid and not larger than a walnut. Albert Lucas (Birmingham Med. Rev., Jan., '95).

Aneurism in Scarpa's triangle, in which instrumental compression above was employed for eighteen days, but had to be abandoned on account of the irritation of the skin which it caused. The aneurism gradually diminished in size and recovery followed. Molloy (Med. and Surg. Reporter, Apr. 22, '93).

Case of false traumatic aneurism of femoral artery in which operative procedures produced death. Drschenewitsch (Mediizinskija Pribawlenija k Morskomu Sborniku, Dec., '94).

Case of extirpation of a femoral aneurism, in a little girl of 11, extending from near Poupart's ligament to the lower part of Hunter's canal; it had been growing for fifteen months, and was not attributable to injury. The main trunk was first secured above the sac, and the whole mass enucleated; thirty-five dilated arterial twigs required ligature, and about five and a half inches of the femoral vein were also removed. The patient made a good recovery. Heurtaux (Bull. et Mém. de la Soc. de Chir., Nos. 9, 10, '95).

Popliteal Aneurism.

The popliteal artery being peculiarly liable to atheroma, it is the most common seat of aneurism after the aorta. Flexion and extension of the knee, if exaggerated but slightly when the vessel is diseased, act as exciting causes. The aneurism sometimes develops in this region without any apparent mechanical cause, and may present itself on either side. It usually grows posteriorly, rapidly penetrating the surrounding alveolar tissue and assuming large proportions. At other times it forms anteriorly, and presses against the bone or the posterior ligaments. Supported by these hard surfaces its growth is much slower.

Case of diffuse popliteal aneurism caused by an exostosis due to ossification of the tendon of the adductor magnus muscle. Similar case reported by Boling quoted in which rupture of the artery was caused by two epiphyseal exostoses. Terrier and Hartmann (London Lancet, May 20, '93).

Symptoms.—Although a sudden pain may reveal the presence of the aneurism, rheumatism of the knee is the usual complaint at the start. The joint then becomes weak and stiff, and examination finally reveals a growing tumor, presenting all the characteristics already described,—expansive pulsations and bruit extending down the leg. The aneurismal tumor can usually be emptied, but in some cases all the subjective symptoms have to be very carefully sought after to be discovered. The tibial pulses usually show a marked difference. Complications frequently follow popliteal aneurism. Posteriorly, it may compress the veins and cause

œdema, or give rise to severe neuralgia by pressing on the popliteal nerve anteriorly; synovitis may be induced, causing severe pain.

Case of popliteal aneurism showing, as only symptom, cramp-like pain in the leg. J. Hutchinson, Jr. (Med. Press and Circ., Oct. 16, '95).

Case of pulsating tumor of the popliteal space simulating aneurism; illustrates importance of using exploring-needle in deep-seated fluctuating tumors. Marmaduke Shield (London Lancet, Oct. 6, '94).

Differential Diagnosis.—Arterial hæmatoma presents the characteristics of popliteal aneurism even when no trauma is found. The bruit may be present, but the pulsation along the course of the vessel is weaker. Osteosarcoma, glandular enlargements, abscess, cysts, may also simulate a popliteal aneurism, but the expansile nature of the latter, and the possibility of emptying the sac, make it impossible to readily establish the nature of the case.

When the femoral artery above does not feel rigid, the aneurism is not due to atheroma and there is no atheromatous degeneration in the vicinity of the sac. Billroth (Wiener klin. Woch., No. 50, '93).

Prognosis.—Popliteal aneurisms occasionally undergo spontaneous cure. Usually, however, it progresses more or less rapidly according to its location; begins to leak; and finally ruptures into the surrounding cellular tissue, the blood extending along the tissues of the leg. The popliteal space becomes at once greatly distended. Considerable pain and faintness are experienced. The typical local symptoms do not cease, however, although considerably reduced in intensity. The limb below becomes livid and cold, and gangrene soon follows, if an inflammatory process does not come on. In the latter there is redness of the skin, local œdema, and severe pain. Suppuration of the joint is then probable.

[Two cases of this kind witnessed by me were cured by means of the iodide of potassium and compression. Both patients are now strong and healthy. J. McFadden Gaston.]

Treatment.—If there is evidence of atheroma digital compression should be preferred, provided there is no fear of impending rupture. Esmarch's bandage may also be employed. Flexion is useful if the aneurism is small. If these fail, ligation of the femoral artery at the apex of Scarpa's triangle gives the best results. The limb should be carefully wrapped in cotton wadding and raised somewhat. This is especially indicated when the sac is large, if it is inflamed, when leaking has begun, or when, through pressure on the popliteal vein, there is œdema of the foot.

Amputation is indicated when gangrene follows ligature, when the sac has ruptured, or if there is caries of the osseous tissues or suppuration around the sac.

Case of posterior tibial aneurism in which the femoral artery in Scarpa's triangle was divided between two ligatures; next day hæmorrhage, suggesting possibility that secondary hæmorrhage from the femoral artery was imminent. An elastic ligature was applied loosely above and instructions given to tighten it in case hæmorrhage should recur. Recovery without further hæmorrhage. Gerster (Annals of Surg., Feb., '94).

Case in which total extirpation of the sac was followed by speedy recovery. Statistics of forty cases confirming this opinion, twenty-eight being cases of arterial aneurism and twelve arteriovenous. Kubler (Beiträge zur klin. Chi., B. 9, H. 1, '92).

Case of bilateral popliteal aneurism; sacs extirpated in two sittings with com-

plete success. Ten cases of this affection reported, with nine recoveries and one death from sepsis. Schmidt (Archiv f. klin. Chi., vol. xliv, p. 809).

Case of double popliteal aneurism treated by compression; three months later both sacs consolidated. Iodide of potassium, administered from the start, still continued. Golding-Bird (Brit. Med. Jour., Jan. 12, '95).

Case of popliteal aneurism cured by forced flexion of the knee. Treatment begun by half-flexion, which is much less painful. Alessandro (Riforma Medica, p. 5, '95).

Three cases successfully treated by ligation of the femoral artery after compression and flexion had been tried without success. Leutaigne (Dublin Jour. of Med. Sci., July, '94).

Popliteal aneurisms, if not too large, permit of the radical operation. The portion of the artery within the aneurismal sac is denuded and its walls are softened. Secondary hæmorrhage is likely to follow ligation at this point. The ligature should be applied outside of the sac or at a distance from the opening in the wall of the artery into the sac. Primary union of the walls of the sac is not to be expected. The inner portion of the sac becomes detached by necrosis. Extirpation of the wall of the sac is not necessary. The wound should not be entirely closed by sutures: the cavity should be loosely packed with iodoform gauze. In the after-treatment iodoform-and-glycerin emulsion is recommended. The cavity heals without trouble. Billroth (Wiener klin. Woch., No. 50, '93).

Traumatic Aneurism.

Traumatic aneurism is not due, like other aneurisms, to an anterior pathological condition of the artery-wall, but to a direct injury to the vessel, resulting in an arterial hæmatoma.

Traumatic aneurism may be caused by a shot or stab wound of an artery, by which the blood is extravasated into the neighboring cellular tissue, until it is arrested. There are three varieties of traumatic aneurism. The true traumatic aneurism is the form in which the artery, generally a large one, has received a punctured wound, which has healed and the cicatrix afterward yields. In this case the external coat of the artery and its sheath form a true sac.

A circumscribed traumatic aneurism is a variety wherein condensation of the surrounding cellular tissue has formed an adventitious sac for the blood. Circumscribed traumatic aneurism is usually due to punctured wounds of small arteries.

A diffused traumatic aneurism may be caused in three ways: (1) by healing of the cutaneous wound before the arterial wound heals; (2) by a subcutaneous injury to the artery without a skin wound; (3) later on, due to a bruise caused by a projectile or instrument, the bruised spot yielding when the remainder of the injury was healed.

A diffused traumatic aneurism should not be considered an aneurism; it is, in reality, but a collection of arterial blood in the tissues, not in communication with the exterior, like an ordinary wounded artery.

Protrusion of the inner coats of an artery through a wound of the outer coat is called a hernial aneurism. It is exceedingly uncommon.

Diagnosis.—That a traumatic aneurism may cause an abscess should be borne in mind; on the other hand, an uncomplicated traumatic aneurism may resemble an abscess. A positive diagnosis may be arrived at by the history of the case, and by withdrawing some of the contents with an asepticized hypodermic needle. Pus will be found if an abscess is present, and fluid blood if an aneurism.

Treatment.—The treatment of traumatic aneurism varies according to its

location. It should be treated like a primary wound of an artery.

Where possible, as on a limb, an Esmarch bandage should be applied, the injured artery exposed by incision, completely divided. Both ends of the vessel are then tied. Every effort should be made to obtain primary union.

When the aneurism is located in a region where Esmarch's bandage cannot be used, as on the neck, the tumor should be exposed, and an opening made just large enough to introduce one finger, which, guided by the current of warm arterial blood, should be carried to the artery leading to the aneurism.

Literature of '96-'97-'98.

Six cases in which aneurism of the arch of the aorta and of the base of the neck by the simultaneous ligation of the right carotid and subclavian arteries. But one death occurred: due to hemiplegia. In this case the arteries on the left side were not permeable, and so could not furnish blood to the brain. Thrombosis occurred. Ligation of the right carotid should never be performed when the left carotid and its branches no longer pulsate.

The operation is not dangerous, provided a completely aseptic ligature is used. Blacque and A. Guinard (Ann. Mal. de l'Or., Nov., '96).

Traumatic aneurism of the femoral artery thirty-eight days after gunshot wound of femur; ligation in Hunter's canal; renal colic as a complication. G. T. Vaughan (Amer. Jour. Med. Sciences, Oct., '96).

Two cases of traumatic aneurism successfully treated by ligation and extirpation of sac. J. T. Howell (N. Y. Med. Jour., Aug. 15, '96).

Left traumatic subclavio-axillary aneurism cured by ligation of the third stage of the subclavian artery. F. T. Heuston (Brit. Med. Jour., Mar. 20, '97).

Traumatic aneurism of internal maxillary treated by ligation of the common carotid. Recovery. H. Langley Browne (Brit. Med. Jour., Oct. 9, '97).

Traumatic aneurism of the ulnar artery in the palm cured by tying the ulnar artery above the wrist. Wm. Robertson (Brit. Med. Jour., Dec. 4, '97).

Two cases of traumatic aneurism of the radial artery, treated by excision of the sac. Recovery. Elevation of the limb, combined with pressure on the sac, will sometimes effect a cure, but at best it is tedious in its application and uncertain in its results. Simple ligation of the vessel above and below the sac is more likely to prove successful. Excision effectually cures the disease, and is easily performed if the sac be of small size. Non-removal of the tourniquet, until the dressing and bandaging of the wound are completed, is a valuable detail. J. E. Platt (Med. Chronicle, Dec., '97).

Cirsoid Aneurism.

As compared to the forms of aneurism already described, this variety is very rarely met with. It should be classed with tumors, being, in reality, an arterial angioma.

Varieties.—Where a single vessel is involved, it is usually called an *arterial varix*; when a number of vessels are included in the mass, it is termed *cirsoid aneurism*; and, when the surrounding veins and capillaries are also dilated, the name *aneurism by anastomosis* is applied to the irregular mass thus formed.

Symptoms.—Although cirsoid aneurisms may be met with in any part of the body, their site of predilection is the head especially, and more particularly the temporo-parietal region. The hands come next in the order of frequency. A cirsoid aneurism appears as an irregularly-shaped, bluish, and flattened mass of dilated blood-vessels, twisted inextricably together, from which project ampullæ, or bags. The skin over this is extremely thin, soft, and doughy to the touch, and is in imminent danger of rupture. Manual examination shows that it is connected

with the arterial system, synchronous pulsation with the heart being evident. Its temperature is generally higher than that of the surface of the body, owing to the increased rapidity of the circulation through the tortuous aneurismal channels. It is easily emptied by pressure, but immediately fills as soon as released. A distinct thrill may generally be heard over it, which can be traced along its branches. It does not give rise to pain unless a nerve is involved in the absorptive process which cirsoid aneurisms give rise to in the surrounding structures. To this process is due the grooves found in bone underlying them and the thinness of the skin covering them.

Diagnosis. — When the discoloration and the general outline of the growth present does not at once establish its identity, a true aneurism may be simulated. True aneurism, however, is usually found upon an artery of considerable size, such as the carotid, the tracheal, and the popliteal, and does not yield so readily to pressure. The bosselated outline of cirsoid is replaced by a regular globular mass. The peculiar doughy sensation communicated to the hand during palpation is peculiar to cirsoid growths. Again, these are habitually situated in the extremities where medium or small arteries are to be found.

Pathology. — Cirsoid aneurisms usually occur as the result of traumatism. This is thought to give rise to paralysis of the vasomotor nerves supplying the region affected, and thus allowing the blood-vessels to be dilated. It has been known to start from a nævus, and it has been traced to an arteritis. In the majority of cases, however, its origin cannot be ascertained. As already stated, it belongs more properly to true tumors, and should be termed, according to Tillmann, "angioma arteriate racemosa."

Literature of '96-'97-'98.

Cirsoid aneurisms believed to be due to arteritis, which weakens the vessel-walls and allows their dilatation. Arteritis explains all cases of cirsoid aneurism following an injury; those following nævi can be explained by a congenital defect of nutrition of the walls of the vessels. J. L. Reverdin (Rev. Méd. de la Suisse, Feb. 20, '98).

Cirsoid aneurism is most frequently found on the scalp and face, but it may likewise be found in the tongue, extremities, internal viscera, and bones.

Prognosis. — Although a cirsoid aneurism may not grow or change for many years, it may also steadily develop in size, and spread by invading the vessels of the surrounding tissues. The thinness of the overlying skin presents constant danger, and rupture of one of the ampullæ may give rise to uncontrollable hæmorrhage.

Treatment. — Removal by excision is, by far, the best procedure to use, with complete arrest of the hæmorrhage by ligation of the afferent and efferent vessels. Among the other measures recommended have been ligation of the various afferent arteries, coagulation of the blood by means of various injections, the galvano-cautery, electro-puncture, and acupressure. But none of these afford satisfactory results in the great majority of cases. In multiple cirsoid of the hand or other extremities, amputation sometimes becomes necessary.

Case of cirsoid aneurism of the right groin in which the external iliac artery was tied and the tumors dissected out. On the tenth day tetanus appeared, and proved fatal in six days. Tillaux (La Semaine Méd., July 25, '88).

Case of extensive cirsoid aneurism of

the scalp, cured by multiple ligatures. Mynter (Annals of Surgery, Feb., '90).

Case of cirsoid aneurism with ligature of the common carotid artery. Decided improvement, notwithstanding heavy work. W. D. Hamilton (N. Y. Med. Jour., Nov. 3, '94).

Successful result in a case of large cirsoid aneurism of the scalp. Blood-supply controlled by acupressure-pins applied to external terminal branches of nutrient arteries. Subsequent crucial incision and vascular tissue entirely removed between the skin and periosteum of flat bones. Compression applied; complete recovery. W. S. Forbes (Med. News, June 15, '95).

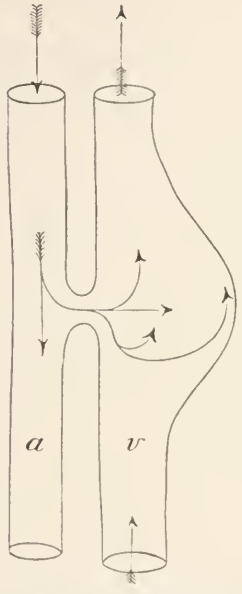


Fig. 1.—Diagram of aneurismal varix. *a*, Artery; *v*, Vein.

Literature of '96-'97-'98.

Case of cirsoid aneurism of the scalp; ligature and acupressure followed by immediate and complete excision; recovery. J. J. Pratt (Lancet, July 3, '97).

Arterio-venous Aneurism.

Varieties.—An artery and a vein may intercommunicate in two ways: (1) when the one vessel opens into the other by a short channel—the so-called *aneurismal varix*—and (2) when between the two vessels there is an adventitious sac: the so-called *varicose aneurism.* Although both terms are incorrect and misleading, they serve to establish a distinction which becomes important when the treatment is considered, the measures indicated in aneurismal varix being dangerous in varicose aneurism.

The difference between the two varieties is illustrated in the wood-cuts printed opposite.

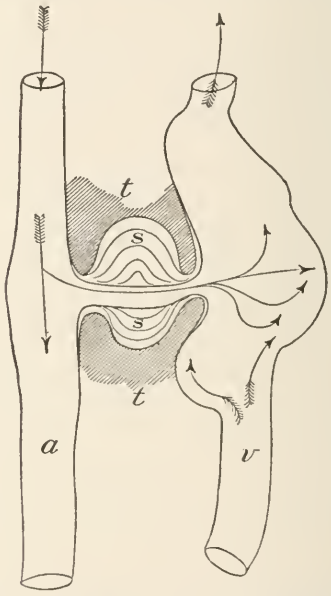


Fig. 2.—Diagram of varicose aneurism. *a*, Artery; *v*, Vein; *s*, Sac, containing a laminated clot on each side of the channel; *t*, Intervascular tissues.

Symptoms.—The receipt of the injury may be attended by syncope if internal vessels are wounded, but superficial vessels are by far those most frequently involved, and aneurismal varix may last for years without serious disturbance. The most common situation of this variety is the bend of the elbow, the result of punctured wounds which penetrate both vessels.

A whirring sound, like the purring of a kitten, is produced by the current passing from the artery into the vein. This sound was compared by Spence to the noise made by a fly in a paper bag. It is more distinct above than below the tumor, and the limb is usually somewhat weaker and colder than is natural. A thrill is felt when the hand is applied over the tumor.

In varicose aneurism there exists, as already stated, a sac between the two vessels; but it is important to remember that this sac is not constituted of the coats of the vessels involved; it is an artificial formation at the expense of the tissues between the vessels. These having been simultaneously wounded, the lymph effused in the course of the inflammatory process forms a partition to limit the extravasation. This extravasation differs from that of a false aneurism in that it communicates with a vein.

The difference between aneurismal varix and varicose aneurism consists, besides the presence of the adventitious sac, of a greater length of the intervening canal in varicose aneurism. A laminated clot on each side of this canal contributing also to reduce its diameter to that of the canal in aneurismal varices, taken as a whole, the symptoms of both conditions are about similar. Palpation sometimes make it possible to detect the presence of the intervening sac, and also, in addition to the thrill and buzzing sound of aneurismal varix, a distinct impulse. An aneurismal murmur or soft bruit may frequently be elicited. The conformation of varicose aneurism is not such as to tend toward much enlargement.

If, according to Tillmann, the point of communication between the artery and vein be compressed, the pulsation in the dilated and tortuous vessels ceases, and they collapse.

The limb is generally wasted below the varix if the case is one of long standing; it may also be œdematous, hard, and enlarged.

In twenty-nine cases of aneurism of the ascending arch of the aorta opening into the vena cava analyzed by Pepper and Griffith, a thrill was observed in some cases; in others a continuous murmur with systolic increase, with sudden development of cyanosis, œdema, and engorgement of the veins of the upper part of the body.

> Case of traumatic arterio-venous aneurism of the arch of the aorta and the innominate vein. The thrill was most distinct over the manubrium sterni, and could be followed down the internal jugular and left brachial veins and over the skull in the course of the sinuses. The autopsy showed an opening in the arch of the aorta between the points of origin of the carotid and the innominate arteries, which communicated directly with the left innominate vein,—dilated at this point to the size of an orange. Long survival after the accident is worthy of notice. Colzi (Lo Sperimentale, Feb., '95).

> Arterio-venous aneurism of the aorta and vena cava superior: patient, a man of 63 years, suddenly affected with œdema of the face and neck, more pronounced on the right side and extending to the upper and lower extremities; subcutaneous thoracic veins much dilated. An intense bruit heard along the sternum; pulsation and thrill felt in the second right intercostal space. Jayle (Bull. de la Soc. Anat., Nov. 20, '93).

Etiology.—Both varieties are caused by traumatisms by which an artery and vein in juxtaposition are wounded simultaneously from a stab or in phlebotomy. Arterio-venous aneurisms were much more frequent when venesection was in

vogue than they are now that this procedure is rarely resorted to.

A true aneurism may gradually adhere to a vein, and give rise to an arterio-venous aneurism.

Case of spontaneous, probably congenital arterio-venous aneurism of the arm and hand, caused by an abnormal communication between the common interosseous artery and a deep branch of the cephalic vein. Ligature of the brachial artery followed by gangrene of the forearm and hand; amputation; recovery. Weidemann (Beiträge zur klin. Chir., Sept. 15, '93).

Pathology.—Besides the features already noted is the fact that the wound between the vessels does not heal, so that at each pulsation a certain amount of blood is forced through from the artery into the vein. The latter pulsates strongly and becomes tortuous and dilated; the veins beyond the aneurismal varix on the limb are likewise dilated. The artery is more or less dilated above, but much contracted below, the lesion.

Prognosis.—An aneurismal varix may, as already stated, cause no very serious disturbance, and is not, therefore, regarded as a dangerous condition. This is not the case, however, with varicose aneurism, as the intervening sac may at any moment become disorganized and give rise to a diffuse aneurism. The varicose veins may also become greatly enlarged, and be followed by œdema and perhaps gangrene.

Case of fourteen years' standing, caused by a punctured wound of the axilla. Arm normal, veins not distended, function perfect, but all over the arm the characteristic bruit could be heard; operation contra-indicated. Osler (Annals of Surgery, Jan., '92).

Case of aneurismal varix of the left internal carotid artery and the cavernous sinus. It has remained unaltered for twenty-three years. C. E. Williamson (Brit. Med. Jour., Oct. 13, '94).

Fourteen cases of arterio-venous aneurism of subclavian published. Case in which there was no syncope at the time of accident and seven months after development of aneurism no functional trouble. Wedenkind (Deutsche med. Woch., No. 16, '95).

Treatment.—In the majority of cases *aneurismal varix* requires no treatment, or no more than the application of an elastic bandage to prevent its growth.

Where extension of the affection causes pain and disturbance in the circulation, compression may be applied above and below and upon the tumor itself; should this not succeed, the artery and vein can be tied above and below the opening, and the aneurism removed. It is only when absolutely necessary that aneurismal varix of the femoral vessels or of the carotid and internal jugular should be submitted to operative procedures.

Unlike aneurismal varix, *varicose aneurisms*, as stated, present an element of danger: the intermediate sac, owing to its histological composition, tending to ulcerate at any moment and to give rise to a diffuse aneurism. Pressure is obviously contra-indicated; it would cause enlargement of the already dilated veins and probably give rise to œdema and gangrene. The best treatment, especially when the aneurism is small, is to tie both vessels above and below the aneurism, and to remove the latter.

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Case in which arterio-venous aneurism followed a wound of the popliteal artery and vein by a spicule of glass. Operation was performed four and one-half weeks after the accident. The sac was opened, both vessels discovered to be injured, and, after an unsuccessful attempt to close the vein by suturing, both were ligated. Of 7 cases of simultaneous ligation of the popliteal artery and vein, in 6 of which these vessels had been wounded,

all recovered, 1 after amputation for gangrene. In 8 other cases the results were entirely favorable. G. P. Newboldt (Lancet, Apr. 23, '98).

In varicose aneurism of the neck or femoral vessels, it is best to cut down upon the artery below and above the sac and ligate without touching the vein or the sac. This method was suggested by Spence, of Edinburgh.

In cutting down upon a varicose aneurism, the incision intended to open the enlarged vein should be followed by one opening the sac, so as to bring the aperture within the artery into the field of operation.

Hunter's method of ligating the artery above the sac is not successful, as the unimpeded circulation of blood into the sac through the vein prevents coagulation of the fibrin. In a general way, it may be said that all small aneurisms, not involving the larger vessels of a limb, should be extirpated, unless important nerves are jeoparded by the dissection, or, as on the face, where it is important to not leave a scar. The treatment selected for larger aneurisms depends upon their situation. Those of the neck which involve the external jugular vein will rarely require treatment, but, should it be necessary, such cases are best treated by double ligation of both vessels. In other situations the simple ligature of the vessels should not be chosen, for it will, in most cases, require as much dissection as will incision or extirpation, while not giving the same immunity from relapse. The surgeon should make an incision down upon the sac in its entire length, and attempt to dissect it from its bed. If this prove difficult or impossible because of inflammatory thickening or intimate connection with important parts, the sac should be incised, for it is often easier to secure the vessels when the sac is freely opened. The sac could then be left entirely in place or it could be partly removed. Suture and simple drainage of the sac have been found sufficient, and it is unnecessary to resort to packing. (Farquhar Curtis.)

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ANGINA PECTORIS.

Definition.—Angina pectoris (stenocardia, breast-pang) is the name given to a group of symptoms which usually depends upon organic disease of the heart or aorta. An attack consists in the sudden onset of agonizing pain in the præcordial or sternal regions, accompanied by a feeling of constriction and in severe cases by a sense of impending death. The pain radiates into the back, the shoulders, and the arms, particularly the left. The patient is pale, haggard, motionless, and often bathed with cold perspiration.

Symptoms.—Suddenly, after exertion, excitement or a hearty meal, the patient feels an excruciating, burning or tearing pain in the heart or beneath the sternum, accompanied with a sense of constriction (*angere*, to throttle), as if the heart were in a vise. The pain radiates into the back, upward into the shoulders, and down the left arm, often even to the finger-tips. It may be felt in both arms, in the neck and head, and even in the trunk and lower extremities. "In true angina the seat of the pain may be entirely way from the chest, and may be, as in Lord Clarendon's father, at the inner aspect of the arm, or about the wrist, or in rare instances confined to the side of the neck, or even to one testis." (Osler.)

Attacks occur in which pain is slight

or absent (angina *sine dolore*). Early attacks are often of this sort. At a later period there may still be no pain, or the paroxysms may sometimes be painful and at other times not.

Literature of '96-'97-'98.

If we regard angina pectoris as one of the terminal phenomena accompanying progressive heart disease of many and varied forms, and consider the affection as but an assemblage of symptoms, I would urge that for purposes of diagnosis the presence or absence of pain is not the essential factor. On the one hand, many purely neurotic affections very closely mimic the pain of angina, and, on the other, in those cases usually described as "angina *sine dolore*" the absence of pain is apt to lead us astray and we may overlook symptoms really of formidable import; thus attacks of transitory dyspnœa may, in some cases, be of greater significance than those of cardiac pain. I allude especially to those attacks of sudden dyspnœa occurring in later life—of course, eliminating the hysterical element—where, after careful and repeated examination, we are unable to find any organic cause to account for the respiratory trouble. In these cases the heart appears sound, and yet there is that indescribable something which tells us that, although no objective signs of disease are present, still our patient is in a precarious condition. D. W. C. Hood (Lancet, Sept. 26, '96).

A feeling of numbness accompanies the pain. There is a sense of impending dissolution. The sufferer sits or stands immobile and hardly dares to breathe. Yet there is no real dyspnœa. The face is pale or livid, the forehead wet with perspiration. The pulse may remain strong and regular. Usually it is accelerated and of increased tension. It may intermit or vary. Exceptionally it is slowed. The paroxysm lasts a few seconds or minutes,—sometimes half an hour or even several hours. At the end of it the patient often belches gas or vomits or has a movement of the bowels, with great relief. The attack may prove immediately fatal. If not, the patient is left exhausted, but regains his usual condition in a few hours or days.

The attack is almost sure to be repeated. This may happen in an hour or not for weeks or months. The length of the interval depends greatly upon the persistence of the patient in avoiding the exciting causes. Successive paroxysms occur with gradually increasing readiness.

Literature of '96-'97-'98.

Angina pectoris is probably due to increased intravascular pressure. We can reasonably infer the presence of dilatation of the heart by the physical signs of displaced apex-beat; gallop-rhythm; a soft, regurgitant murmur in the tricuspid or mitral area; by venous phenomena; and by the congestions, cyanosis, and dropsy that attend this affection. The results of cardiac percussion may be confirmatory, but are not looked upon as essential in the diagnosis of cardiac dilatation. Five cases to illustrate the following propositions:—

1. When dilatation of the heart supervenes in a patient the subject of an attack or attacks of angina pectoris, the subjective symptoms may subside. At the same time the physical type of the individual changes.

2. Angina pectoris may occur in a patient who has had dilatation of the heart when the organic condition (dilatation) is removed by treatment. J. H. Musser (Amer. Jour. of Med. Sciences, Sept., '97).

Attention drawn to that form which is found in association with dry pericarditis: the pain in these cases is situated at the base or middle of the sternum; it may also be in the epigastrium and over the cardiac area. It radiates outward toward the arms. These signs, in truth, afford no differentiating clue. On careful auscultation, however, to-and-fro friction may be heard coincidently with the cardiac movements, with hyperæsthesia in the præcordial region; and the facts of

its frequently following tonsillitis and rheumatic ailments, and not being amenable to the operation of vasodilators and stimulants, serve to distinguish it from most cases of coronary angina: it is an exocardial angina. The treatment of the condition is, naturally, that of pericarditis. M. Pawinski (La Semaine Méd., Oct. 6, '97).

Special variety of musical heart-murmur, resembling a feeble groan or chirping of chickens. Similar cases described by Capozzi, in which a constant lesion was found,—namely, a regular perforation of a free valve. Case of a man, aged 30, suffering from anginal attacks. Double aortic murmur, the diastolic part of the murmur being musical. The apex-beat was in the fifth space, outside the nipple-line. No history of rheumatism. History of syphilis. Death in one of the attacks of angina. At autopsy mitral valves found normal; aortic valves thickened, two cusps being adherent; the third was perforated near the aortic parietes, but not adherent. Coronary arteries healthy. Teece (La Rif. Med., Apr. 2, '97).

Diagnosis.—In true angina pectoris skilled observers almost invariably find evidence of organic cardiac or aortic lesion. In a supposed case these should be sought most carefully. Particularly to be looked for are arteriosclerosis, hypertrophy or dilatation of the left ventricle, aortic regurgitation, and feebleness of the muscular power of the heart.

Literature of '96-'97-'98.

True angina always associated with cardiac lesions, especially of the coronary arteries; but the absence of physical signs do not always affect the diagnosis, as it frequently occurs that the lesions are only discovered after death. Presumptive signs which deserve attention:—

The age of the patient; true angina is very rare before forty.

The pain commences always in the heart, while in pseudo-angina it is ascribed to the arm and radiates in several directions.

The infrequency of the attacks in true angina, the patient being liable to succumb in the second or third attack.

True angina is provoked by effort, emotion, and disorders of digestion.

It occurs in the day-time, while in false angina the attacks are generally nocturnal.

Patients suffering from true angina are pale and can neither stir nor breathe. In the false angina he is agitated, gets up from bed, and runs to the window for fresh air. Rendu (Med. Press and Circular, July 22, '96).

Intercostal neuralgia causes pain along an intercostal nerve, not radiating as in angina pectoris. It presents points tender to pressure near the vertebræ and sternum and in the axilla. It is not associated with disordered circulation.

Gastralgia is apt to occur when the stomach is empty. The pain does not stream into the shoulder and arm. While there may be collapse and a sense of impending death, there is no evidence of heart disease. Both gastralgia and intercostal neuralgia are likely to occur in anæmic young women, rather than in middle-aged men.

On the other hand, the pain of true angina pectoris may be felt lower down than the præcordia.

In a specimen taken from a man, aged 33, who died in an attack lasting half an hour, there was evidence of recent subacute aortitis with nearly complete obliteration of the openings of both coronaries. The pain had been of the nature of intense gastralgia. Huchard (Le Bull. Méd., Nov. 25, '94).

As already stated, the termination of an attack may be marked by the discharge of gas. Particularly if there is no extreme cardiac pain, this may lead the patient, and in some instances has led his physician, astray.

Literature of '96-'97-'98.

It is important to bear in mind that symptoms of cardiac embarrassment as-

suming the character of "angina *sine dolore*" may be described by the patient as arising from dyspepsia. These patients ascribe their discomfort to flatulent distension, and they do so from the well-known fact that a discharge of flatus gives relief to the uncomfortable sensation. It is well, in advanced middle life, to pay rather more than ordinary attention to flatulent discomfort coming on after food or exertion. A careful examination will often solve the problem and will conclusively prove that the symptoms are rather those of cardiac inefficiency than of stomach trouble. D. W. C. Hood (London Lancet, Sept. 26, '96).

Cardiac asthma is dyspnœa due to a weak heart and occurring more or less paroxysmally. Pain is not prominent. The picture is apt to include pulmonary œdema, enlarged liver, and dropsy, and it could hardly be mistaken for angina pectoris. It should be remembered, however, that angina may attack a person who is already suffering from failing compensation.

Pseudo-angina pectoris, or hysterical angina, occurs in females or neurasthenic men, usually under the age of 40, without evidence of organic cardio-vascular changes. There are low tension, feeble second sound, and soft arteries. The attacks are spontaneous and are apt to be nocturnal and periodic (menstrual). They last an hour or two, being more prolonged than the true paroxysms. The patient is agitated, writhes, or walks about the room, and talks. The heart feels, not constricted, but distended. The pain is not apt to be so severe as in true angina pectoris. Paræsthesiæ and vasomotor symptoms are prominent. Death never occurs.

Hysteria.—It should, of course, be remembered that hysteria may be combined with organic disease, and that a careful physical examination should be made in any suspected case; but the discovery of mitral disease would not be inconsistent with a diagnosis of pseudo-angina.

Syphilis.—A history of syphilis in a man, even if under 40 years of age, renders the occurrence of true angina pectoris less improbable than it otherwise would be, for there is a possibility of syphilitic aortitis obstructing the orifices of the coronaries.

Tobacco, Tea, etc.—Excess in tobacco (less often alcohol, tea, and coffee) and lead poisoning may occasion spurious angina, or again they may aggravate a genuine paroxysm depending on organic lesions.

Literature of '96-'97-'98.

I am inclined to think that angina is more closely simulated by forms of alcoholismus than by any other functional disturbance. The following is a typical example of that form of false angina met with among spirit-drinkers: The patient was a steward in a nobleman's establishment, and was a well-built, florid-looking man of about 45 years of age. There was no symptom of organic disease of heart or vessels. The attacks were described to me, and, from the account, simulated in every point the ordinary features of angina. I suggested the possibility of alcohol, but the imputation was considered absolutely untenable. Some few days after the interview I found the patient maniacal from delirium tremens. D. W. C. Hood (London Lancet, Sept. 26, '96).

While certain cases are evidently true angina and others equally obviously pseudo-angina, some are extremely puzzling.

Etiology.—Males over 40 years of age in comfortable worldly circumstances make up the majority of sufferers from angina pectoris. Predisposing causes are: alcohol, syphilis (arteriosclerosis, tabes dosalis), rheumatism, gout, diabetes, chronic nephritis, and influenza. Sometimes attacks are hereditary.

[Many physicians are attacked. Out of forty cases of true angina seen by Osler eight were medical men. H. F. VICKERY.]

Literature of '96-'97-'98.

Four cases of angina pectoris of several weeks' duration noted following febrile inflammations of the tonsils. The trouble thought to be a neuralgia of the cardiac plexus occasioned by toxic materials formed in the tonsils. Zilgien (Revue Méd. de l'Est, Oct. 15, '97).

As exciting causes may be named: physical exertion, mental strain, profound emotion, and digestive disturbances. The attacks may come in the day-time, especially at first; but some of the worst occur at night; so that finally they may make the patient dread going to sleep.

Pathology.—It is exceptional for attacks of true angina pectoris to be observed in persons presenting no evidence of organic circulatory lesion. The commonest underlying conditions are sclerosis of the coronary arteries, degeneration of the myocardium, cardiac hypertrophy, atheroma of the aorta, aneurism of that vessel near its origin, and aortic regurgitation. There is, however, "hardly an affection of the walls or cavities of the heart, scarcely a morbid condition of the arteries that nourish it or spring from it, with which the distressing malady has not been observed to be associated." (Da Costa.)

Recent writers lay stress on obliteration of the lumen of the coronary arteries as the essential basis of true angina pectoris, which obliteration may be occasioned either by sclerosis of the vessels or by changes in the aorta at their origin. "So intimately associated is the true paroxysm with sclerotic conditions of the coronary arteries that it is extremely rare apart from them." (Osler.) (Same view. Whittaker.)

Case of angina pectoris without lesions of the coronaries in which death occurred during a paroxysm. Aortic and mitral endocarditis was found post-mortem, but no lesion whatever of the coronaries. Numerous personal autopsies on the bodies of old people, at the Bicêtre Hospital, where there had been no complaint of angina during life, and yet the coronaries were found to be almost occluded by atheromatous plaques. Pilliet confirmed these observations. He had found a large number of obstructed coronary arteries which had never caused angina. Auscher (Bull. de la Soc. Anat., Oct. 9, '91).

Two cases in which the coronary arteries were atheromatous, calcified, and rigid, and showed great narrowing of lumen; in one case, indeed, they were scarcely permeable. In neither instance had there ever been an attack of angina pectoris. Tison (Bull. de la Soc. Anat., May 27, '92).

The immediate, precipitating conditions of a paroxysm are not known, but they are supposed to be connected with disturbances of the vagus, or, perhaps, the sympathetic nerves. Nothnagel reported a series of cases under the title "Angina Pectoris Vasomotoria" which seemed to be due to a pure neurosis. They followed exposure to cold, and were ushered in by spasm of the peripheral arterioles, which presumably produced the cardiac disturbance because of the increased exertion demanded of the heart in order to propel the blood through narrowed channels. Cases of this sort must be rare. Authors quote Nothnagel without mentioning similar personal observations.

From a neuralgia or a neurosis true angina pectoris differs in being usually fatal, in attacking men ten times as often as women, and in being associated with organic changes in the neighboring structures,—viz., the heart and aorta.

Lesions of the cardiac plexus and the branches of the vagus have been found

in repeated instances of angina pectoris, but that such lesions are invariably present and essential to the disorder has not yet been proved. "The cardiac nerves may be seriously implicated in aneurism, in mediastinal tumors, in adherent pericardium, and in the exudate of acute pericarditis, without causing the slightest pain." (Osler.)

The late Sir Benjamin W. Richardson regarded angina pectoris as an actual disease analogous (as Trousseau held) to epilepsy, and due to a disturbance in the sympathetic nervous system.

Debove says that in tabetic angina pectoris there is no organic lesion of the heart or large vessels and that the attack must be regarded as a visceral crisis. Dana refers cardiac crises in tabes to a degenerative irritation of the vagus.

[It should, however, be remembered that aortic disease is rather frequent in tabetic patients. H. F. VICKERY.]

In regard to the causation of attacks of angina pectoris in the graver cases which are associated with serious structural disease of the heart and vessels, J. Burney Yeo states that in by far the greater number of deaths from organic disease of the heart all the various lesions may be present which have been found in fatal cases of angina and yet no true anginal attacks have ever been complained of. In his opinion there is some additional circumstance needed to account for the angina. The most serious forms of angina seem to have a complex causation. First, there must be a neurosal element; the nerves of the cardiac plexus suffer irritation, and an intense cardiac nerve-pain is excited; this acts as a shock to the motor nerves of the heart, and thus reacts on the heart-muscle, which, in fatal cases, is already on the verge of failure from organic causes; and, if there should be excited at the same time some reflex arterial spasm, the heart will have to encounter an increased peripheral resistance as well. In such cases the rapidity of the fatal issue is no argument against the neuralgic nature of the angina. In certain conditions, especially in habitual high arterial tension, strain is apt to fall (when the aortic valves are competent) rather on the first part of the aorta than on the ventricular surface, and anginal attacks are more prone to occur in these cases, as this part of the aorta is in such close relation with the nerves of the cardiac plexus, rather than in those cases in which the strain is felt on the interior of the cardiac cavities. The causation of the less grave and more remediable forms of angina is also, in many instances, complex. A cardiovascular system, feeble and poorly nourished, on account of anæmia, may be submitted to undue strain; or there may be some intoxication—such as that of tea, tobacco, alcohol, gout, or some intestinal toxin—irritating the cardiac and vasomotor nerves, increasing peripheral resistance, and so exciting anginal attacks, which may altogether pass away and be completely recovered from. Vasomotor spasm, as a unique cause of attacks of angina, must be set aside as inconsistent with extended clinical experience. Cases of angina pectoris, both of the milder and graver forms, occur without any evidence of vasomotor spasm or of heightened arterial tension; and the conditions of heightened arterial tension, together with a feeble cardiac muscle, very commonly co-exist, without any tendency whatever to the development of anginal attacks. The argument in favor of a vasomotor causation has been inferred from therapeutic experiment and the relief to the paroxysm which has attended the use of agents

which cause arterial relaxation. But most, if not all, of these vasodilators are also anæsthetics, and, as Balfour has pointed out, it is probably to their anodyne action on the sensory cardiac nerves that they owe their chief efficacy; Grainger Stewart has also pointed out that nitrite of amyl has a direct effect on nervous structures, and that it relieves other forms of neuralgia.

Prognosis.—The underlying condition is apt to prove fatal eventually, and it may end life in the first paroxysm; but a careful regimen may prolong existence for years; and Flint, Bendel, and Labolbary have each reported cases of recovery.

The signs of danger during any particular attack are the subjective sense of impending death and the feebleness and irregularity of the pulse. The general prognosis is, of course, influenced by the stage which the organic circulatory changes have already reached.

The pseudo-attacks are apt to be repeated oftener than are the genuine, but the prognosis is good both as to life and to the final disappearance of the trouble.

Literature of '96-'97-'98.

True angina, when it occurs in dilatation of the heart, admits of a prognosis more favorable than when it occurs with other mural conditions, as myocarditis or hypertrophy, without dilatation.

Grave cases of dilatation of the heart, conversely to the above, may be looked upon as amenable to successful treatment if the patient should have paroxysms of true angina pectoris. J. H. Musser (Amer. Jour. of Med. Sciences, Sept., '97).

Treatment.—During a paroxysm the first remedies to employ are such as will dilate the arterioles. Nitrite of amyl is the best because it acts with the greatest rapidity. A "pearl" of this drug may be crushed in a handkerchief or in cotton placed in the bottom of a glass tumbler, and inhaled. Nitroglycerin may be injected subcutaneously ($^1/_{100}$ to $^1/_{50}$ grain), or a tablet of this substance may be masticated. It is readily absorbed from the mouth and acts almost as quickly as when given hypodermically.

Literature of '96-'97-'98.

Nitroglycerin acts best in the pure angiospastic forms of angina pectoris, not so well in cardiac pain due to aortic disease, and still less in stenocardia due to myocarditis. Schott (Ther. Monat., Mar., '96).

For treatment of attack itself, rest, the inhalation of 5 or 6 drops of nitrite of amyl and an hypodermic injection of $^1/_{100}$ grain of nitroglycerin are to be resorted to. To overcome the syncope ether, caffeine, or camphorated oil, the latter in 10-per-cent. strength, are to be employed. Friction should also be applied to the limbs and, should there be evidences of pulmonary involvement, venesection must be practiced, while, if respiration fails, rhythmic tractions of the tongue must be performed. Fifteen- to 45-grain doses of antipyrine may be given by the stomach or by rectal injection, or smaller amounts of phenacetin may be used; to the point of pain chloride-of ethyl spray may be applied. Lyon (Revue de Thér. Med.-chir.; Ther. Gaz., Oct. 15, '98).

In angina pectoris pearls of amyl-nitrite recommended, especially in the beginning of the attack. The dose is from 5 to 10 drops. Should the attack last for any length of time injections of nitroglycerin advised. A good formula is as follows:—

℞ Spirit of nitroglycerin, 10 minims.
Cherry-laurel water, 3 drachms.

M. Twenty minims to be injected subcutaneously.

Small blisters to the præcordium are often useful. Between attacks the diet should be very limited and the use of alcohol and tobacco be forbidden. Iodides should be given for at least from two to four years following an attack, and it is well to alternate the sodium and potas-

sium salts and combine them with digitalis or caffeine. Huguenin (Allgemeine med. Cen.-Zeit., No. 14, '98).

Relief by these means is often immediate; but, if not, ether should be inhaled. Chloroform is also advised by excellent authorities. Flint thinks it not without danger, if the heart is weak; ether, on the other hand, is a stimulant. Morphine, subcutaneously, is a valuable and sometimes an indispensable remedy. Whittaker suggests that it be given with caution in a condition which may anyway terminate in sudden death. The morphine ($^1/_4$ grain) may be guarded by atropine ($^1/_{150}$ grain), and in case of alarm also by strychnine ($^1/_{30}$ to $^1/_{20}$ grain). Electricity has also been recommended.

Electricity is generally unreliable or dangerous, and faradization should be used only in threatening syncope. Huchard (Univ. Med. Mag., May, '92).

The application of the continuous electric current along the course of the vagus in the neck and down the arm, in cases where a distinctly painful aura is experienced in the hand, has been found useful in warding off attacks. Burney Yeo (Practitioner, May, '93).

Electricity certainly seems to exercise its best effects in those cases in which the pain is of a very positive neuralgic character, with no co-existing organic disease, although the presence of structural changes in the heart and blood-vessels does not contra-indicate the judicious use of either form of current. Rockwell (Hare's "System of Practical Therap.," vol. i, p. 394).

Hot and stimulating applications over the præcordia, such as a strong mustard poultice, are appropriate, as are also heat and friction for the extremities. Sometimes an ice-bag is put over the heart. Alcohol and aromatic spirit of ammonia are of benefit in case the cardiac action is feeble. Syncope demands such drugs as digitalis, digitaline, caffeine, strychnine, and camphor, employed hypodermically. I have known oxygen to contribute to a favorable result in collapse due to chronic myocarditis with dilatation of the left ventricle, and cannot see why it might not be well for a subject of angina pectoris to keep some ready in his house.

Between attacks it is of vital importance to avoid the predisposing and exciting causes. Rest and moderation are demanded. As for drugs, nitroglycerin, taken after meals in doses just short of causing headache, has a distinct inhibitory effect upon the paroxysms. In some instances it might be better to order it every three hours, as its influence is not long continued. Nitrite of sodium (2 to 5 grains) may replace nitroglycerin.

Literature of '96-'97-'98.

For treatment between attacks care should be taken that exercise does not immediately follow a meal and that sudden motions are avoided. Mild exercise should be taken. Smoking should be refrained from. Massage and friction of the right chest with alcoholic liquids may be resorted to. Patient should refrain from all rich dishes and fermented drinks and tea, coffee, and alcohol, and should live largely upon milk, eggs, green vegetables, and properly-cooked fresh meats. Water should be taken at each meal. For two or three weeks out of every month 30 to 40 grains of iodide of potassium should be taken a day, and for the remaining days of the month $^1/_{100}$ grain of nitroglycerin may be similarly taken. Where there is feebleness of heart due to myocarditis a combination of digitalis and nitroglycerin is of value. Lyon (Revue de Thér. Med.-chir.; Ther. Gaz., Oct. 15, '98).

A new remedy is erythrol-tetranitrate in grain doses four times in the twenty-four hours. If this drug is given in spirit and water (1 grain in 1 drachm of alcohol and 7 drachms of water) the

tension begins to fall in two or three minutes; if given in a pill, the time is twenty to forty minutes; if given in tabloid form and chewed, the time lies somewhere between the two. The drug was not introduced to replace amyl-nitrite and nitroglycerin in cutting short attacks, but only to replace them in preventing the onset of the attacks. J. B. Bradbury thinks the tablet undoubtedly the best form of administration.

Literature of '96-'97-'98.

Severe case in a physician, in which erythrol-tetranitrate (1-grain doses) was taken steadily, at eight hours' interval, as a prophylactic. For three weeks there was immunity from attacks, although some weariness and oppression came on after six or seven hours from taking the tablets. Now taken four times in the twenty-four hours with marked relief.

The initial fall of the pulse-tension depends on the mode of administration. If the drug is given in spirit and water (1 grain in 1 drachm of alcohol and 7 drachms of water) the tension begins to fall in from two to three minutes; if given in a pill and swallowed, the time is from twenty to forty minutes; if taken in tablet form and masticated the time lies somewhere between the two. The best form of administration is undoubtedly the tablet. The alcoholic solution sometimes irritates the stomach. J. B. Bradbury (Brit. Med. Jour., Apr. 10, '97).

Erythrol-tetranitrate in $^1/_2$-grain tablets, one to be taken three times a day, followed by prompt relief in angina pectoris. James Adams (Brit. Med. Jour., Feb. 12, '98).

The persistent use of potassic iodide is very effective. Ten or 15 grains may be given thrice daily before meals in half a glass of water; or 20 grains three times a day for twenty days, followed by nitroglycerin for ten days. The iodide is believed to dilate the arterioles and to promote arterial nutrition. Sée supposed that also by enlarging the calibre of the coronary arteries it invigorated the myocardium.

Literature of '96-'97-'98.

Accepting that angina is dependent upon calcification of the coronary arteries, decalcification of these arteries by increasing the elimination of lime indicated. If an individual is put upon a diet poor in lime, an abundant elimination of the lime is provoked in him if he takes at the same time a solution composed of the following:—

℞ Sodium carbonate, 150 grains.
Lactic acid, a sufficient quantity to saturate it.

Add

Lactic acid,
Syrup, of each, 150 grains.
Distilled water, 6 ounces.

This amount to be taken during the day.

This also acts as a diuretic and the quantity of lime eliminated is increased from 50 per cent. to 52 per cent. A diet which is poor in lime is also indicated.

Daily diet: meat, about eight ounces; bread, fish, potatoes, and apples, each, three ounces. This contains ten times less lime than a corresponding quantity of milk, or four times less than the diets advocated by Hoffman as substitutes for milk. The potatoes may be replaced by fresh beans, cucumbers, or peas. Cheese, eggs, beets, cabbage, rice, and spinach, all of which are rich in lime, contra-indicated. These measures employed in twelve cases of angina and atheroma. In three cases of angina pectoris the success was remarkable. Rumpf (Berliner klin. Woch., Mar. 29, '97).

Arsenic in small doses also tends to avert the paroxysms. In case of fatty degeneration of the heart it would be contra-indicated.

Quinine and methylene-blue have also been recommended.

Case of periodical angina permanently cured by quinine. Koudriavzev (Jour. de Méd. de Bordeaux, Oct. 6, '95).

After the administration of methylene-blue the attacks of angina diminish in frequency and intensity and finally cease altogether. Case of a man, aged 50, with well-marked atheroma and an aortic murmur, who obtained immediate relief from this remedy after iodide of potassium and nitroglycerin had entirely failed. G. Lemoine (Le Nord Médical, No. 15, '95).

The treatment by saline baths and by the Schott method of exercises has a most potent effect in improving the condition of the cardiac muscle and vessels, and appears to have a direct effect in making the attacks less numerous and severe, and even in causing them to cease during a period of months or years. The movements must be made with especial care and caution in these cases, and the resistance at the onset must be at a minimum. The artificial saline baths should contain from 1 to 3 per cent. of salt, and from ¼ to 1 per cent. of chloride of calcium, and should gradually be strengthened by the addition of carbonic acid. (H. N. Heineman.)

Literature of '96-'97-'98.

For the relief of visceral and capillary engorgement we may resort to medicinal agents. Although the baths and exercises do this to a marked extent, the administration of ½ grain of calomel (well triturated) thrice weekly at bedtime, succeeded the next morning by a dose of Carlsbad sprudel salts, adds materially to the effect.

After the visceral engorgement has been much relieved, the nitrites and in some cases nitroglycerin are indicated. Heineman (Therap. Gaz., May 15, '97).

The cardiac tonics—sparteine, strophanthus, strychnine, valerian, and in suitable case digitalis—are of the greatest utility.

Literature of '96-'97-'98.

Digitalis is of doubtful utility. It should not be given unless there is an excess of dilatation. J. H. Musser (Amer. Jour. Med. Sciences, Sept., '97).

Case in which all usual remedies having become useless, hyoscine was used upon the assumption that angina pectoris was a neurosis of the sympathetics. An injection of $^1/_{75}$ grain of hyoscine hydrobromate given; in fifteen minutes the patient was relieved. In half an hour she was sleeping quietly. This dose, although larger than safe, was not followed by any poisonous symptoms. There was slight dizziness, and a perceptible flushing of the face. W. W. Bostwick (Med. Record, May 8, '97).

If angina pectoris is due to increased intraventricular pressure, as suggested by Musser, we should expect the arterial system to play the chief rôle, and not the heart. The action of nitrite of amyl is interesting in this connection. It relieves the aorta and takes away the resistance of the heart. Digitalis has a curious effect; and its use suggests this theory: if angina pectoris can be stopped by hypodermic injections of the nitrate of amyl, we can, if we give enough aconite, do away with intraventricular pressure altogether. If this is true, digitalis must be death to the heart in angina pectoris. H. C. Wood (Med. Record, June 5, '97).

The general tendency to anæmia and defective oxygenation must never be lost sight of, and general tonics, including the use of oxygen-gas, will be of excellent service.

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Angina pectoris is due to a simple hyperæmia of the spinal sensory centres. A spinal ice-bag from the fourth dorsal to the third lumbar vertebra, applied once or twice a day for from forty minutes to an hour, will not only relieve the attacks, but will completely eradicate the trouble. Amyl-nitrite is useful. Another remedy recommended very highly is oxygen by inhalation. Oxygen alone will relieve an attack of angina, but in

combination with cold over the spine and heat to the extremities it is the speediest method of relief at our command. Most efficient formula of oxygen for administering consists of 2 parts of pure oxygen, 1 part nitrous monoxide, and 1 per cent. of ozone. B. Kinnear (Med. Record, July 16, '98).

Attacks of pseudo-angina may be treated with asafœtida, ammoniated tincture of valerian, or compound spirit of ether, and the outward employment of heat-friction and rubefacients. Sometimes recourse must be had, however reluctantly, to morphine. The statement in clear and decided language of a favorable prognostic prospect is of great benefit. Between attacks the underlying condition should be cared for. (Heineman.)

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ANHALONIUM LEWINII (MESCAL BUTTON).—The mescal button is obtained from a plant which grows in a valley of the Rio Grande, in Mexico. The tops of the plant when dried constitute the commercial form of *Anhalonium Lewinii*, first described by Lewin. They are brownish in color, circular, and from one to one and a half inches in diameter. The button is hard and can be pulverized in the mortar with difficulty. In the mouth, however, under the action of the saliva, it swells and rapidly becomes soft, giving a nauseous and bitter taste, with a marked sensation of tingling in the fauces. An alkaloid (anhalonine) has been extracted from anhalonium. It is a glucoside, with an action somewhat like that of strychnine, and is very poisonous.

Dose.—The following preparations may be used: A tincture (10 per cent.). Dose, 1 to 2 teaspoonfuls. An extract of leaves (100 per cent.). Dose, 7½ to 15 minims. Powdered leaves, 7½ to 15 grains. The tincture and extract should be made according to the processes prescribed in the United States Pharmacopœia for such preparations.

Physiological Action.—Lewin found anhalonium to be an intensely poisonous drug, and that a few drops of a decoction used by him in the frog sufficed to produce almost instantly very marked changes, chiefly consisting in the appearance of shrinking of the body, so that the batrachian seemed to pass into a mummified condition. Simultaneously with these appearances, the animal raised itself upon its fore-extremities and remained standing in this position like an ordinary quadruped, or crawled about. After fifteen minutes this spastic condition passed off and he rapidly returned to his normal condition. When larger amounts were given, death occurred in tetanic rigidity. It would seem that the symptoms produced by it are closely allied to those of strychnia, for Lewin noted that even after the spinal cord was severed peripheral irritation caused tetanus. On pigeons it was found that the drug produced convulsive vomiting in a few moments when given hypodermically. The bird spread its wings, crouched down to the ground, and if disturbed would twitch convulsively. Later the head was drawn sharply back, the mouth opened widely, and general convulsions asserted themselves. When death occurred the heart was always found in diastole. In rabbits the symptoms were those of strychnia poison. The taste of the liquid preparations is somewhat disagreeable, unless it be disguised by a suitable vehicle, such as a mixture of fluid extract of licorice and elixir of yerba santa. The powdered drug is best administered in wafer-paper, cachets, or capsules. (Lewin.)

It seems to produce an effect in the human subject resembling that of Indian hemp: visions ranging from flashes of color to beautiful landscapes, figures, etc. It depresses the muscular system without having, however, produced intoxication, as would be the case with alcohol. Anhalonium is not hypnotic and sometimes induces wakefulness.

The principal feature of the visions is the color effect. The power of the drug seemed to be mainly due to the development of these entrancing visions. Prentiss and Morgan (Ther. Gaz., Sept. 15, '95).

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Personal experience in the use of the drug. The principal phenomena were extraordinary color-visions, and also brilliant form-illusions. After-effects of the drug quite unpleasant, producing nausea and headache for several hours afterward. Symptoms produced resembling the visual phenomena of ophthalmic migraine, suggesting that possibly the drug might be found useful in this affection. S. Weir Mitchell (Jour. Nervous and Mental Dis., Sept., '96).

The important effect of the alkaloid of the mescal plant in therapeutic doses would appear to be: 1. A direct stimulation of the intracardiac ganglia. 2. An initial slowing of the heart. 3. An elevation of arterial tension. 4. A direct stimulation of the brain-centres and motor centres of the cord, as shown by the increase in reflex excitability. Dixon (Brit. Med. Jour., Oct. 8, '98).

Investigations carried out on writer himself were made to determine the active ingredient producing the peculiar visual hallucinations described by Prentiss and Morgan, Weir Mitchell, and others. In the first place, an alcoholic extract of mescal buttons corresponding to 4 1/2 drachms was taken, and afterward an amount of the individual alkaloids corresponding to the quantity in the extract. The active ingredient was found to be mescaline. The symptoms produced, both by the alcoholic extract and mescaline (1 1/2 grains), were colored visual hallucinations, slowing of the pulse, dilatation of the pupil, loss of time-relations, heaviness of the limbs, nausea, and headache. After anhalonidine (1 1/2 to 3 3/4 grains) some sleepiness and heaviness of the head were observed, but no visions or change in the pulse. Anhalonine (1 1/2 grains) only produced slight sleepiness, while lophophorine (30/100 grain) induced a painful feeling at the back of the head and burning and redness of the face. The pulse fell from 78 to 70 per minute, but all the symptoms were transient. After a resin obtained from the plant no visions or other typical symptoms, except heaviness of the limbs, were obtained; thus the theory that this is the active ingredient is disposed of. Heffter (Archiv f. Exp. Path. u. Pharm., xl, 385, '98).

Anhalonium, in drop doses, a sustainer of the respiration and a cardiac stimulant. Seminal emissions may occur from its use without erection. A valuable adjuvant to digitalis, according to Landry.

Therapeutics.—The use of mescal buttons is credited with beneficial results in general "nervousness," nervous headache, nervous irritable cough, abdominal pain due to colic or griping of the intestine, hysterical manifestations, and in other similar affections where an antispasmodic is indicated; as a cerebral stimulant in depressed conditions of the mind,—hypochondriasis, melancholia, and allied conditions; as a substitute for opium and chloral in conditions of great nervous irritability or restlessness, active delirium and mania, and in insomnia caused by pain, in color-blindness.

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Case indicating that anhalonium is probably a valuable solvent of uric acid. Doses of 4 drops of the tincture daily, continued without increase, caused the evacuation daily of several pints of urine. D. A. Richardson (N. Y. Med. Jour., Aug. 8, '96).

ANILIPYRIN.—This is a product introduced by Gilbert and Yvon (1897), made by heating one equivalent of acetanilid with two equivalents of antipyrine. It is soluble in less than a quarter of its weight of distilled water.

Dose.—The medium daily amount to be given is from 15 to 30 grains; the average single dose is 7 or 8 grains.

Physiological Action.—It is feebly toxic; in the guinea-pig, given in doses of rather less than 30 grains for each kilogramme of the animal's weight, it produces tetanic convulsions, hypothermia, and death. Anilipyrin acts as antipyretic when given in doses one-fifth as large as the poisonous dose. This action is more pronounced than that of antipyrine and less than that of acetanilid.

Therapeutics.—It is said to act particularly well as an antipyretic and analgesic in influenza, acute articular rheumatism, migraine, and neuralgia.

ANIMAL EXTRACTS. — Under this heading are included not only the extracts of various tissues at present utilized in therapeutics, but, likewise, the tissues themselves and all the preparations, active principles, etc., that are obtained from them.

Of the animal tissues, and the products obtained from them, employed therapeutically, the ductless glands, whose functions are now known to be intimately associated with metabolism, have by far taken the lead over all other portions of the animal organism utilized. Indeed, if they continue to increasingly engage attention as they have of late, the time is not far off when antitoxins will find in them a potent rival. On this account, considerable space has been devoted to the subject as a whole; but, as many of our views still belong to the domain of conjecture, the purpose of this article will be to present what evidence clinicians have furnished, along with what deductions are, for the present, warranted.

The ductless glands and their preparations will first be considered in the order of their importance in therapeutics. A few pages will then be devoted to the various other organs and products at present being tried, the so-called "organic extracts," some of which are rapidly losing their claim to recognition.

Thyroid Gland.

In the latter part of the last century, King, of London, showed experimentally that the colloid substance of the thyroid gland passed directly into the lymphatics; and Schiff, in 1859, reviving views previously held by many, showed that this organ played an important part in the economy, through some substance which it secreted, and that intraperitoneal transplantation of the healthy gland in a dog shortly after thyroidectomy had been performed prevented cachexia strumipriva, which follows this operation. Then followed, in 1883, the experiments of Kocher and Reverdin, demonstrating that, in man as well as in animals, the same phenomena occurred under identical circumstances. This led the way to the investigations of Murray and Ord, who, followed by many observers, then showed that myxœdema could be counteracted by the internal administration of thyroid gland. Since then this organ has been used as a remedy in a large number of disorders and with marked success in some, the best results being obtained in conditions more or less distinctly associated with myxœdema.

Physiological Action.—Under the influence of a preparation of thyroid gland the body-weight diminishes and the excretion of nitrogen, water, carbonic

acid, sodium chloride, and phosphoric acid increases, indicating a decided influence upon general metabolism.

Increased metabolism, shown by (1) elevation of temperature; (2) increased appetite, with more complete absorption of nitrogenous foods; (3) loss of weight, with nitrogen excreted in excess of that taken in the food; (4) growth of skeleton in the very young; (5) marked improvement in body-nutrition generally; (6) increased activity of mucous membranes, skin, and kidneys. The rheumatic symptoms and the anæmia are not only not relieved, but are frequently aggravated. G. W. Crary (Amer Jour. Med. Sciences, May, '94).

Appearance of glycosuria as a result of the administration of tablets of thyroid gland. Ewald (La Sem. Méd., p. 357, '94).

Cell-nutrition undoubtedly affected in a striking manner by thyroid feeding; increased metabolism occurs as result of quickened circulation. Autotoxic process interfered with. C. K. Clarke (Canadian Practitioner, Oct., '95).

Literature of '96-'97-'98.

Experiments to ascertain whether the loss of the weight takes place at the expense of the fat of the body or of the protoplasmic tissues, such as the muscles. Conclusions: that fresh thyroid acts energetically on albuminous decomposition, but that some of the efficiency is lost to the thyroid substance in the process of making tablets or in keeping it too long. The administration of the artificial products over long periods of time is, however, not without action on albuminous substances. Gluzinski and Lemberger (Centralb. f. inn. Med., Jan. 30, '97).

Metabolism during thyroid treatment studied in three goitrous patients, aged, respectively, 19, 24, and 27 years, their usual diet being given. 1. The goitre diminished in size in all the cases. 2. The body-weight decreased one kilogramme in one case, and two kilogrammes in the other two cases. The diminution in weight depended on the duration of the treatment. 3. The amount of urine was increased. 4. The nitrogenous excretion appeared to be increased, chiefly through the urine. 5. The increase in nitrogenous excretion caused a negative nitrogenous balance of 5.46, 5.2, and 4.34, respectively. 6. The uric-acid excretion was increased in two of the cases examined. 7. The excretion of solid chloride and phosphoric acid was increased. The considerable increase in phosphoric-acid metabolism, mentioned by Roos, not confirmed, but only phosphoric acid in the urine, and not in the fæces, was estimated. Irsai, Vas, and Gara (Deutsche med. Woch., July 9, '96).

Under the effect of thyroid there is an increased rapidity of combustion throughout the body, while the increased urinary flow which follows its use decreases the patient's weight considerably as well. Another important effect of the thyroid gland is to hasten cell-activity. Robert Hutchinson (Brit. Med. Jour., July 16, '98).

Following conclusions deducted from a series of investigations on thyroid treatment: 1. The loss of weight after the ingestion of thyroid is not due conclusively to loss of water and albumin, but in part, in some cases, to loss of fat. Thyroid causes, therefore, a genuine reduction of fat. 2. So far as this is due to increase of normal tissue-change it is moderate, except in myxœdema. 3. Increase of metabolism does not occur in all persons who take thyroid. It is most marked in myxœdema. 4. The proteid deficit in thyroid feeding may continue even in case of superalimentation, and is, therefore, a specific, toxicogenic effect of the substance. 5. Thyroidin shows effects on metabolism like those of the extract of the glands, but thyreotoxin and potassium iodide give no such results. 6. Absence of thyroid function causes not only defective growth and serious bodily and psychical degeneration, but also a distinct decrease of gaseous interchange, of heat-production, and of total metabolism. The excessive and abnormal function causes increased metabolism and emaciation. Administration of the gland in such cases is followed by increased metabolism and improvement of symptoms. 7. The loss of fat and albumin in

thyroid feeding shows a plain analogy with the same process in Basedow's disease and is toxic when it reaches a high grade. Thyroid preparations must, therefore, be used cautiously in the treatment of obesity. A. Magnus Levy (Zeit. f. klin. Med., B. 33, p. 258, '98).

It seems exceedingly probable that the untoward phenomena resulting from thyroid extirpation are due to an intoxication, to some kind of an autoinfection, whose harmful influence is no longer counteracted by the normal action of the thyroid gland. The effect of thyroid transplantation or implantation, together with the positive results produced by thyroid feeding or by the use of extracts, speaks for the action of the gland by means of a secretion,—that is, at a distance from the gland; and this is against the view that some have suggested, that the toxic substances are brought to the gland and there transformed or rendered innocuous. The gland acts, therefore, not by virtue of storage or of direct blood purification. (J. W. Warren.)

In the light of our present knowledge, therefore, it would seem likely that Vassale's view, that the thyroid gland possibly secretes a substance capable of transforming toxic products of tissue-change into others more easily eliminated, is the correct one.

Study of sixty cases. The action of thyroid extract is complex. It undoubtedly produces a mild, feverish condition, the action and reaction of which are often of considerable benefit. It is a direct cerebral stimulant. There is a strong probability that at some periods of life the administration of the thyroid supplies some substance necessary to the bodily economy. Bruce (Jour. of Mental Science, Oct., '94).

Substances which diminish the excitability of the nervous system, bromide of potassium and antipyrine in particular, will diminish or suppress the convulsive symptoms following thyroidectomy. Gley (La Sem. Méd., Apr. 13, '92).

In dogs the symptoms of tetanus caused by thyroidectomy can be overcome by large doses of potassium bromide. Fifty dogs thus kept alive two years and two six years after the operation. Same results obtained with hypodermic injections of a concentrated solution of the substance of the thyroid gland, and with a solution of the gray matter of the brain of healthy dogs. Canizzaro (Deutsche med. Woch., No. 184, '92).

Intravenous injections of solutions of brain, testicle, or blood-serum have no such effects as the thyroid juice. Experiments favoring the belief that the thyroid gland has the function of preventing autointoxication, by transforming the toxic products of tissue-change into substances easily eliminated, or by directly neutralizing them by its own secretion. Vassale (Review of Insanity and Nervous Dis., June, '92).

In Bright's disease two to six thyroid glands of the sheep per week increase the density of the urine and the quantity of urea is augmented very sensibly. Gifford (Brit. Med. Jour., Mar. 31, '94).

Literature of '96-'97-'98.

Experiments on dogs showing that after removal of the thyroid the urotoxic co-efficient rose to nearly double. The toxicity of the blood-serum also increased after thyroidectomy. The thyro-iodine of Baumann, when given to athyroidized dogs, caused the urotoxic co-efficient to return almost to the normal, and relieved most of the nervous symptoms. Spoto (Gior. dell Assoc. di Napoli, p. 526, '96).

Five mice and three guinea-pigs were treated with thyroid extract. Swelling of the face, emaciation, and loss of strength. In all cases the administration was continued till the animal died. No lesion found of either nerve-elements or neuroglia; no varicose or atrophied dendrites or loss of gemmulæ. The corpora showed no loss of angularity, and the axons and appendages were all healthy. No nuclear change in the cells ascer-

tained; the blood-vessels were carefully examined without the discovery of any lesion. It would seem from these investigations, so far as they go, that the toxic action of thyroid is of a different nature from that of other conditions, and one which we are not, therefore, in a position to understand. Berkley (Bulletin of the Johns Hopkins Hospital, July, '97).

Two main hypotheses have been advanced as to how the secretion of the thyroid acts on the tissue of the body: First, that the tissue forms toxic substances which are neutralized by the thyroid secretion; this is the antitoxic theory. Second, that the thyroid secretion promotes or regulates normal metabolism; this is the trophic hypothesis. All the newer evidence seems to point to the latter as the more probable one. H. Sneve (Columbus Med. Jour., Dec. 20, '98).

Iodine plays an important rôle in the thyroid body. It serves to produce an antitoxin, and it is likely that iodine is not the only antitoxic agent which is found in the thyroid body. If the toxic product which normally is taken up and destroyed in the thyroid is found in the circulation after destruction of the thyroid, not only clinical symptoms, but also anatomo-pathological irritation of the nerve-centres follows. This toxin is a poison of the nervous system, which exists normally in the organism, but which the thyroid body arrests and destroys. Blum (Bull. Méd., Oct. 5, '98).

As a result of studies, the following conclusions drawn: 1. Absolutely fresh thyroid gland is not poisonous in the usual sense of the term, when absorbed through the alimentary canal. 2. The symptoms of induced thyroidism are manifestations of an intoxication resulting from the ingestion of decomposed thyroid material. 3. The so-called experimental thyroidism is not specific for the thyroid alone, for the ingestion of many substances derived from animal tissue other than the thyroid gland may produce an intoxication strikingly similar in every respect to that of experimental thyroidism. 4. Most, if not all, animal tissue yields substances which, if injected in large quantities directly into the circulation or beneath the skin, will produce an intoxication often very similar to that produced by injections of various substances derived from the fresh thyroid tissue. 5. The effect resulting from the intravascular or subcutaneous injections of aqueous extracts, decoctions, and concentrated extractives of the thyroid tissue of the thymus, of muscle, etc., are by no means necessarily indicative of the function and the action of the hypothetical internal secretions of the same tissues during life. 6. The utilization of the fact that ingestion of decomposed thyroid material produces on certain occasions an intoxication with certain symptoms similar to those of Graves's disease is not justifiable for the furtherance of the theory that the symptoms of exophthalmic goitre result from an overproduction of the thyroid secretion. 7. Our results lead us to conclude, with Drechsel, that the fresh thyroid tissue yields at least probably two substances that are capable of palliating the symptoms of the acute cachexia in totally thyroidless dogs. 9. The thymus-tissue also yields one and probably two substances that are equally as capable as the thyroid extractives of palliating the acute cachexia of totally-thyroidless dogs. Neither of the above substances is an enzyme, nor does either contain iodine. 10. Neither the feeding of minced raw thyroid glands nor the injection of aqueous thyroid extracts, decoctions, and concentrated solutions of the extracted palliative thyroid principles is capable of keeping totally-thyroidless dogs alive longer than a few weeks (possibly three weeks). Still less capable are the thyroid preparations containing decomposition-products. R. H. Cunningham (Jour. of Exper. Med., vol. iii, p. 147, '98).

Active Principles of Thyroid.—It is quite clear that the thyroid gland is especially characterized by the presence of a compound proteid of peculiar constitution, and that this substance, which Robert Hutchinson calls "colloid matter," is the active constituent of the gland. There is also present another

proteid, a nucleo-albumin, in small amount, which Hutchinson considers as probably contained in the cells of the acini. In addition there are certain extractives to be found,—viz., xanthin, hypoxanthin, inosite, volatile fatty acids, paralactic acid, succinic acid, and calcium oxalate,—bodies, however, of no special physiological significance. (R. H. Chittenden.)

Iodine has recently been shown by Baumann to be a normal constituent of the thyroid gland. Thyro-iodine—the name given by him to the product obtained—contains over 9 per cent. of iodine, and it becomes inert when the latter agent is removed from it. Baumann has also shown that the amount of iodine in the gland is much greater when the organ is normal than when it is goitrous.

Literature of '96-'97-'98.

Thyro-iodine is best prepared by treating the gland with a solution of sodium chloride. The globulin is precipitated by a current of carbonic acid, and the solution acidified and boiled, when a precipitate of albumin and thyro-iodine falls. The latter is an organic substance combined with nitrogen and iodine (10 per cent.). Clinical observations show that thyro-iodine is very active, patients suffering from goitre and myxœdema having been cured by it. Baumann maintains that the entire active substance remains on the filter after coagulation of the albumin. Baumann (Zeit. f. physiol. Chem., B. 21, pp. 319 and 481, '96).

The colloid material, believed by Hutchinson to be the active ingredient of the thyroid gland, has been found to contain iodine in organic combination, the colloid matter owing its activity to the presence of this organic compound of iodine.

Literature of '96-'97-'98.

The proteids of the gland are two in number: 1. A nucleo-albumin present in small amount and probably derived from the cells lining the acini. 2. The colloid matter, made up of a proteid and a non-proteid part, the latter containing, in all probability, Baumann's thyroidin. Certain extractives are also obtained from the gland, as creatin, xanthin, etc., which have been found absolutely inert when administered either to healthy persons or to cases of myxœdema. The same result obtained on giving the nucleo-albumin. The pure colloid matter gave the ordinary signs of thyroid activity in healthy individuals, and in large doses distinct thyroidism resulted. Marked beneficial results were obtained on administering it to a patient with myxœdema. The proteid and the non-proteid constituents of the colloid were then given separately, and although benefit resulted from the former, yet the most favorable results were obtained from the administration of the latter. Robert Hutchinson (Brit. Med. Jour., Jan. 23, '97).

Thyro-antitoxin is the provisional name of another active principle, obtained by Frænkel, from the thyroid gland of the sheep. It exerts no influence on nutrition comparable with that of fresh thyroid or thyro-iodine.

The albuminous bodies were precipitated by acetic acid, and by feeding experiments it was ascertained that the precipitate had no marked effect, while the filtrate that was obtained possessed the well-known properties of the thyroid gland, or, in other words, contained the physiological active principle. Frænkel (Wiener med. Bl., S. 48, '95).

Literature of '96-'97-'98.

In the tetanic condition toxins are found in the blood which are rendered innocuous by the thyro-antitoxin of Fränkel, formed in the gland-alveoli. In the myxœdematous condition, on the contrary, a "thyroproteid" is formed in the tissues, passes into the blood, and is fixed by the thyroid. Here it is rendered innocuous by an enzyme which splits it up into two parts,—a proteid constituent, which unites with thyro-

iodine, and the other a carbohydrate. Notkin (Virchow's Archiv, Suppl., B. 144, '96).

Preparations.—The implantation of a portion of the thyroid gland beneath the skin was soon superseded by the hypodermic method, but the latter presented another drawback, that of requiring the constant attendance of the physician. Besides this the preparations often produced suppuration. The gland itself, therefore, administered in the form of desiccated powder in tablets or capsules, is preferred by the majority of practitioners.

Literature of '96-'97-'98.

The administration of the gland in its natural condition preferred to subcutaneous injections of the juice or its extract, because there is no risk of introducing into the syringe septic material, and there is always the assurance that the gland is in a fresh condition. The gland from the sheep should always be used on account of the absence of tuberculosis in this animal. The dose is 1 lobe, 15 to 20 grains, in bouillon, slightly fried or raw when cut in small morsels. H. Huchard (Jour. des Prat., No. 16, p. 242, '96).

It seems evident, all in all, that the entirely unobjectionable whole gland prepared in desiccated powder or capsule or in compressed tablet is the only means by which we ought to attempt to treat conditions in which this animal substance has been found useful. Editorial (Ther. Gaz., May 15, '97).

The glands of young sheep have given the best results. When the glands themselves are to be administered, considerable care should be taken, and they should be obtained through a veterinary surgeon. Again, the glands should be carefully examined to ascertain that they are not diseased.

Over 50 per cent. of sheep's thyroids examined showed more or less evident indications of deviation from the normal. Emphasis on the need of care in the selection of glands for administration. A. Napier (London Lancet, Feb. 4, '93).

Literature of '96-'97-'98.

It is usually advisable for the doctor himself to get the thyroid lobes. If it is left to the butcher quite other substances may be supplied. The glands of sheep, and especially of young sheep, are to be preferred, tuberculosis being extremely rare in this animal. The sheep has two thyroid bodies, one on each side of the trachea. The upper part of each thyroid corresponds exactly to the track of the butcher's knife in bleeding the animal; the top of the gland is almost always cut by the knife, and this forms a good guiding mark for finding the gland at once. Gabriel Gauthier (Lyon Méd., June 27, July 11, '97).

The thyroids should be removed as quickly as possible after the animal is killed. After careful antiseptic preparation of the field of operation, the glands should be dissected out with aseptic instruments, and after removing all the fat and connective tissue they should be put into a sterilized, covered glass dish which has been previously weighed. The organs, as soon as secured, should also be taken to the laboratory and weighed. They are then cut into small pieces with aseptic scissors and double their weight is added of a mixture containing 2 parts of glycerin and 1 part of sterilized water. After standing in this for twenty-four hours, they are poured into a suitable bottle, which is stoppered with cotton and sterilized. The extract thus obtained is poured into small sterilized bottles and will keep for a considerable time.

Of the extracts containing 20 per cent. of the thyroid gland, 1 drachm per week may be given, and of the thyroid glands themselves 1 lobe,—that is, one-half of the entire gland. The latter may be ad-

ministered chopped finely and cooked, or it may be macerated after chopping in a small quantity of water, and the extract thus obtained given in beef-tea without cooking. Broiled slightly, the natural juices of the thyroid are less altered when administered.

A powder may be made by separating the gland from all foreign tissues and, after chopping finely, desiccating at a low temperature to avoid cooking. The objection to this method is that the powder has an unpleasant odor, which, however, may be disguised by mixing with cacao and administering in pill form; 8 pills, of $^5/_6$ of a grain each, are given daily. This amount is nearly equivalent to one lobe of the thyroid. This powder may also be dispensed in tablets or inclosed in gelatin capsules.

If small quantities have to be administered, owing to antagonism on the part of the patient, etc., Murray's method may be used. The gland is cut into small pieces, and macerated in an equal amount of glycerin, the extract being obtained by pressure and filtration and administered in drop doses. The dose is four times that employed in hypodermic medication.

Glycerin extracts of the gland are much more effectual in treatment, especially with regard to the wasting, than thyroidin. Although thyroidin is doubtless one of the active antitoxic principles in the thyroid, there are probably other derivatives of therapeutic value which have not yet been isolated. Spoto (Giorn. dell' Assoc. Napoli di. Med. e Natur., vol. vi, p. 526).

Literature of '96-'97-'98.

The action of the thyroid gland is to convert the salts of iodine, which are present in the blood, into iodothyrin. It would therefore seem advantageous to administer iodothyrin in place of thyroid extracts. De Cyon (Med. News. Oct. 1, '98).

Aïodine is a new preparation obtained by precipitating with tannin the iodo-albuminates: the bases and the mucous substance of the thyroid gland. Fifteen grains of aïodine correspond to one hundred and fifty grains of fresh, or three hundred grains of desiccated, thyroid gland. Schoerges (Nouveaux Remèdes, Aug. 24, '98).

The fresh gland furnishes 20 per cent. of extract or 27 to 28 per cent. of dry powder. The powder is employed in tablet form, in the dose of $^5/_6$ of a grain.

Literature of '96-'97-'98.

A powder that will keep for a long time may be prepared in the following manner: After an aseptic removal of the glands, and removing all foreign tissues, pulpify and mix them with the biborate of soda and powdered charcoal. In this manner is obtained a dry powder, which is put in capsules, each containing $1\,^2/_3$ grains of the extract. This preparation, when not exposed to heat, is not altered. Vigier (Archives de Neurol., Mar., '96).

A preparation that will also keep a long time is the following: Immediately after the death of the animal the gland is excised under all aseptic precautions, all extraneous tissues are removed, and the gland is powdered with boric acid. When a sufficient number have been prepared they are taken to the laboratory, cut up, and triturated with sugar and an additional amount of boric acid. The sugar absorbs the juices, and the resulting mixture is almost free from liquid. This mixture is desiccated at a temperature of 86° C., and divided into small masses, which are coated with gelatin, each mass containing about $1\,^2/_3$ grains.

Each lobe of the thyroid produces about 26.8 per cent. of powder; three capsules are therefore equivalent to one lobe of the gland, or the therapeutic unit. (Yvon.)

Untoward Effects and their Prevention.—The dangers attending the use of thyroid preparations depend, to a degree, upon the manner in which the remedy is administered. When the pure gland is used, the physiological phenomena caused by an overdose will show themselves,—namely, a weak, rapid pulse and shortness of breath; vomiting, cardiac oppression, a feeling of tightness around the chest, vertigo, and coma. When dried powder or compressed tablets are used symptoms of ptomaine poisoning may be added to those mentioned.

Too great an increase in the pulse-rate and vomiting are signs that the patient is getting too much. H. W. G. Mackenzie (Centralb. f. Nerv. Psy., July, '93).

Literature of '96-'97-'98.

In giving thyroid preparations, the best guide is the pulse. Any considerable quickening or palpitation should lead us to discontinue the drug until the cardiac action is again normal. There are no dangers in the use of the drug, provided we begin with small doses, from 1 to 2 grains of American extracts, and gradually increase, watching the pulse. It should never be given to a patient who cannot be closely watched. R. C. Cabot (Med. News, Sept. 12, '96).

The fall of blood-pressure, which has been observed to follow intravenous injection of thyroid extract, is to be attributed to the "extractives," and not to the active ingredient. Neither the administration of ovarian substance nor of fresh parathyroid glands has any curative influence in myxœdema. Robert Hutchinson (Jour. of Physiol., No. 3, vol. xxiii, '98).

Case in which a man took for obesity nearly 1000 5-grain tablets of thyroid extract within five weeks. After the first three weeks he began rapidly to develop the symptoms of acute Graves's disease. When thyroid was stopped and patient was put upon arsenic all the symptoms disappeared quickly, excepting the eye-changes and the goitre, which were still notable for about six months. A. V. Notthaft (Centralb. f. innere Med., Apr. 16, '98).

Among the less active symptoms are anorexia, diarrhœa, malaise, lassitude, and pain in the extremities; headache, increase of urine, rise of temperature, various eruptions, urticaria, transient and papular erythema and eczema, and, in some cases, nervous manifestations—neuralgia, delirium, convulsions, delirium of persecution, aphasia, monoplegia, etc.

Some of the discomforts of treatment are a feeling of tightness in the chest, with itching, burning, and other abnormal sensations in the skin, and a sense of weakness. G. Stewart (Practitioner, July, '93).

Literature of '96-'97-'98.

Thyroid powder, when given subcutaneously, also produces a rise of temperature. It is a pyrogenic agent. This action of the thyroid shows that we should be careful in its administration to persons affected with heart disease. Isaac Ott (Med. Bull., Oct., '97).

The drug is badly tolerated by general paralytic and tubereulous patients, still worse by patients over 60 years of age, and worst of all by fat patients, especially those in whom there is reason to suspect fatty degeneration of the heart. C. C. Easterbrook (Lancet, Aug. 27, '98).

Among the early warnings obtainable when large doses are being administered is *undue* loss of weight.

Loss of weight is an early sign of improvement, which sometimes goes beyond the requirements of health. Rise of temperature and pulse, increase of urine, faintness, headache, prostration, cardiac weakness, and neuralgic pains have been observed during treatment. J. J. Putnam (Amer. Jour. Med. Sci., Aug., '93).

Literature of '96-'97-'98.

When thyroid extract is used freely in continuing doses, it sometimes produces

a series of phenomena constituting so-called thyroidism. The most important of the symptoms are loss of weight, shortness of breath, and a weak and rapid pulse. In all cases in which the extract is being used freely and continuously, but especially in those cases in which the symptoms are not those of myxœdema, the patient should be weighed at least every two weeks, and any undue loss of weight or disturbance of circulation or respiration should be the immediate signal for the withdrawal of the remedy or a great reduction of the dose. H. C. Wood (Univ. Med. Mag., Apr., '96).

When the preparation of thyroid first employed tends to give rise to untoward effects, a change of preparation is sometimes sufficient.

Toleration of thyroid medication does not depend upon volume of thyroid body, but upon its functional activity. This explains very variable effects observed. Taty and Guérin (Revue de Thérap. Médico-Chir., Nov. 1, '95).

Literature of '96-'97-'98.

Case in which the glycerin extract of thyroid could not be taken, even in small doses, without the production of very distressing symptoms, while the powdered extract was well borne. J. M. Anders (Med. News, June 12, '97).

If even then the preparations are not borne, portions of the gland or glandular extract may be administered by the rectum. The extract, as shown by Lépine, can also be injected into the rectum.

According to Mackenzie, inunctions of a thyroidin ointment prepared as shown below may be employed.

When patients cannot bear even very small doses of thyroid, twice a day, after hot sponging and vigorous rubbing, the body is well anointed with the following mixture:—

℞ Thyroidin, 10 parts.
Ether, 60 parts.
Lanolin, 480 parts.—M.

A rise of temperature of one degree followed the inunction. The process was well borne and followed by satisfactory results. E. Blake (Prov. Med. Jour., Sept. 1, '94).

To maintain a cure, or where large doses are required, there are considerable advantages in giving the fresh gland. A convenient way to prepare it is to mince the gland fine, allow it to stand for half an hour in sufficient cold water to cover it, then express through muslin and add the liquid extract of beef-tea. It is best to begin treatment with a dry extract, as the dose is under more perfect control. H. W. G. Mackenzie (Clin. Jour., Apr. 25, '94).

As noted in cases treated by Stabel, thyroid gland is likely to cause gastric disturbance most frequently during warm weather. He found that this could be avoided by preserving the glands or their preparations on ice, when they were not to be used at once.

According to Lanz, the danger consists more in the extreme alterability of the products than in the toxicity of their active principles. A series of experiments showed that 9 grains of the English thyroidin, dried by the ordinary procedures, gave rise to tachycardia, whereas the absorption of from 5 drachms to 1 ounce of raw fresh thyroid gland did not give rise to any disturbance. Examination of pastilles, tablets, tabloids, capsules, etc., revealed bacteria, including even the septic vibrio, ptomaines, etc.

Literature of '96-'97-'98.

In four cases exhibition of thyroid extract has been followed by violent outbreak of gouty or rheumatic symptoms, not existent at the time at which the drug was given. Objection in reporting these cases is not to claim that the extract of thyroid was the cause of the rheumatic symptoms, but simply to call the attention of the profession to the subject, so that careful observation may

be made upon a wider scale. H. C. Wood (Phila. Med. Jour., May 28, '98).

Gastric digestion, as shown by Howitz, in no way modifies the properties of the glands. Maurange has obtained a peptone which can be kept indefinitely either in the dry state or in a syrupy condition with the addition of an equal quantity of glycerin and alcohol. It may be given in wine or sweetmeats containing 50 per cent. of sugar. The author has used these peptones, named by him peptothyroidin, peptovarin, peptomedullin, etc., for fifteen months and though still very imperfect and prepared only as needed, they have been perfectly tolerated even by confirmed dyspeptics.

As to the use of any of the active principles described, clinical results have not sufficiently sustained the theoretical views concerning their actual worth to warrant a wholesale recommendation of them. Again, physiological investigations have seemed to suggest that their influence upon general metabolism is different from that exercised by the complete gland. Still, in a few instances, excellent results have been obtained from them and further study will doubtless make it possible to isolate an active principle devoid of useless and perhaps harmful elements. For the present, therefore, the gland itself or prepared in desiccated powder or capsule or in compressed tablet should only be employed.

A promising agent is Robert Hutchinson's colloid. Here, however, the inert extractives removed are mere foreign bodies, the colloid itself being a composite proteid containing various active elements, including, probably, Baumann's thyroidin. We are not dealing, therefore, with an active principle *per se*, but, in reality, with the active part of the gland. The advantages claimed for colloid are: 1. A constancy of dose is insured. The quantity of colloid in different glands varies considerably; hence the amount of active substance in dried preparations of the whole gland is really not constant. 2. The drug is quite pure. 3. The pure colloid is free from taste and odor, and keeps indefinitely. 4. A very small dose is required. 5. The colloid is absorbed with great ease and rapidity. 6. The administration of the colloid matter is really the most economical way of giving the thyroid. There is no waste of active material, as occurs in the preparations of thyroidin.

Therapeutics.—The diseases in which thyroid gland and its preparations are utilized are so numerous that a general review of the results obtained would afford but little information. The various disorders, including the clinical data collated upon each, are therefore presented separately, and in alphabetical order.

Arrested Growth.—In the treatment of dwarfing thyroid extract has been found to be of great value, whether the condition be associated with idiocy or not. The observations of Virchow, in 1883—to the effect that rachitis, cretinism, and dwarfing were dependent upon disease of the thyroid gland fully supported by experiments showing that thyroid feeding was capable of restoring normal growth when the latter had been arrested by thyroidectomy—pointed distinctly to thyroid as a valuable remedial agent. More recent experiments have further sustained this view and shown that the leanness attending rapid growth in youths could be attributed to an exaggerated activity of the thyroid gland.

Effect of thyroid in children and youths who, although not cretins, were backward in growth. In 6 of these

cases, in which the arrest of growth was due either to chronic albuminuria (2), rickets (2), masturbation (1), or congenital debility (1), there was a renewal of active growth,—in some very considerable. E. Hertoghe (Bull. de l'Acad. Royale de Méd. de Belgique, '95).

Literature of '96-'97-'98.

In three cases of myxœdematous idiots, aged from 14 to 30 years, the striking points were growth and a loss of weight. In three other cases of obesity in idiots the growth under treatment was proportionately more in four, five, or six months than the average growth of the eighteen untreated imbeciles or epileptics during their tenth, eleventh, and twelfth years, which were taken as more nearly approaching normal children to control these experiments. Bourneville (Progrès Méd., Feb. 1, '96).

The rate and amount of the increase in height is in inverse ratio to the age of the patient and to the stage of the treatment. Thus, children grow more than adolescents, and adolescents more than adults; the rate of growth is at first very rapid, but becomes slower as the height approaches that of the normal for the age. John Thomson (Brit. Med. Jour., ii, 615, '96).

Number of recorded examples of dwarfing associated with atrophy of the thyroid gland cited. Experiments on animals corroborate the idea of a direct connection between the two conditions. Four cases in which thyroid treatment was resorted to to overcome dwarfing in children, in which normal height was reached. J. J. Schmidt (Therap. Woch., Nov. 15, '96).

In nine cases, including four idiots, large doses of sheep's thyroid (half a lobe every day or every second day) given. The way most of them gained in height was most remarkable. In one the gain amounted to $2\,^{2}/_{5}$ inches in five months. Boullenger (Pediatrics, Mar. 15, '97).

Case of cretinism in which patient was 30 years of age, and resembled a child of 7 or 8 years as to height. Under thyroid extract improvement was marked, in $2\,^{1}/_{2}$ years the increase in height being 7 centimetres. W. Sinkler (Phila. Med. Jour., May 7, '98).

Cretinism.—Clinical and experimental evidence have demonstrated that absence or impotence of the thyroid gland, as a result of insufficient development, removal, or neoplastic overgrowth, leads to a general condition at least closely allied to that witnessed in cretinism, while symptoms of myxœdema are preeminent in the majority of cases. That much was expected from thyroid as a remedial agent need hardly be emphasized.

It may be said that the hopes entertained have been fully realized. The mental condition is greatly improved and the stunted growth is counteracted. As the patient approaches the height normal to his age the growth continues at the normal ratio. The myxœdematous symptoms are rapidly removed, the abnormal appearance being thus in great part corrected. If begun early in the disease and continued systematically, the treatment seems capable of finally restoring the patient to a comparatively normal condition.

In a recent paper Osler was able to collect sixty cases of sporadic cretinism which had been observed in America, demonstrating that the disease is not limited to European countries, as thought by many.

Literature of '96-'97-'98.

Case of cretinism in which mental as well as physical condition improved. Immediately upon the exhibition of the remedy and at the close of the first week a decided decrease in weight was observed. At the end of the first two months he had lost twenty-two pounds and gained over an inch in height. General condition, physical as well as mental, has considerably improved. H. H. Vinke (Med. News, Mar. 21, '96).

TABLE OF PUBLISHED CASES OF CRETINISM TREATED BY THYROID ADMINISTRATION.

Found in Literature up to May 1, 1896, by Frederick Peterson and Pearce Bailey (Pediatrics, May 1, '96).

AUTHOR AND REFERENCE.	SEX.	AGE AT BEGINNING OF TREATMENT.	DURATION OF DISEASE.	SYMPTOMS.	DURATION OF TREATMENT.	CHARACTER OF TREATMENT.	RESULTS.
Robin. Lyon Méd., 1892, lxx, p. 405.	F.	7 yrs.	Congenital.	Characteristic. Unable to walk or talk.	Not stated.	Extract followed by implantation.	Complete change in appearance. Walks.
Carmichael. Lancet, 1893, i, p. 580.	F.	8½ yrs.	Congenital (?).	Characteristic appearance. Intelligence limited. Unable to walk or talk.	9 mos.	Hyp. inject. of extract and feeding of raw gland.	Skin became normal. Learned to walk and run. Intelligence improved.
Evans. Br. Med. Jour., 1893, i, p. 767.	M.	8 yrs.	Not stated.	Not stated.	6 weeks.	One lobe of sheep's thyroid twice a week.	No improvement.
Hellier. Lancet, 1893, ii, p. 1117.	F.	2⅓ yrs.	1–2 yrs. (?).	Characteristic appearance. Unable to walk or talk. Idiotic.	4½ mos.	Extract.	Œdematous symptoms gone. More intelligent. Cannot walk or talk.
Lunn. Br. Med. Jour., 1893, p. 1273.	F.	26 yrs.	Not stated.	Idiotic. No other details.	Not stated.	Not stated.	Became relatively intelligent and menstruation was resumed.
Ord. Lancet, 1893, ii, p. 1113.	F.	6½ yrs.	Congenital (?).	Characteristic appearance. Could not walk or talk.	8 mos. (?).	Had been grafted previously with temporary benefit. Raw gland and extract.	Great improvement. Learned to walk in three months. Can talk.
Ibid.	M.	3 yrs.	Congenital (?).	Could not talk. Always dwarfed and bow-legged. Skin dry.	8 mos. (?).	Raw gland, dried gland, and extract.	Marked. Learned to talk. Growing rapidly.
Ibid.	M.	9 mos.	Not stated.	Typical.	. . . . .	. . . . .	Improved rapidly, but died of intercurrent diphtheria.
Ibid.	M.	9½ yrs.	In infancy.	Characteristic physically, but intelligent. Height, 31 in. Could walk.	8 mos. (?).	Compressed extract.	Grew 1½ inches in four months. Improvement in other respects not so marked.
Owen. Br. Med. Jour., 1893, p. 1273.	F.	26 yrs.	In infancy.	Characteristic. Height, 40¼ in.	. . . . .	Tabloids.	Improvement.
Patterson. Lancet, 1893, ii, p. 1116.	M.	19 mos.	12 mos. (?).	Characteristic.	8 mos.	Extract.	Œdematous symptoms gone. Can stand. Learning to talk. Has sixteen teeth.
Vermehren. Deut. med. Woch., 1893, p. 256.	F.	29 yrs.	24 yrs.	Characteristic.	3 weeks.	Thyroidin.	Marked improvement.
Wood. Aust. Med. Jr., 1893, p. 166.	F.	1 yr. 11 mos.	. . . . .	. . . . .	1 mo.	Had been grafted. Raw gland.	One month's feeding without benefit.

TABLE OF PUBLISHED CASES OF CRETINISM TREATED BY THYROID ADMINISTRATION.
(*Continued.*)

AUTHOR AND REFERENCE.	SEX.	AGE AT BEGINNING OF TREATMENT.	DURATION OF DISEASE.	SYMPTOMS.	DURATION OF TREATMENT.	CHARACTER OF TREATMENT.	RESULTS.
Rehn. Ver. der XII Cong., 1893, p. 224.	F.	4½ yrs.	Not stated.	Characteristic.	2 mos.	Extract.	Marked improvement.
Ibid.	F.	6½ yrs.	Not stated.	Characteristic.	2 mos.	Extract.	Marked improvement.
Anson. Lancet, 1894, i, p. 1063.	F.	10 yrs.	Congenital.	Characteristic appearance. Could walk clumsily. Mental process slow.	1 yr.	Raw gland and glycerin extract.	Œdematous symptoms gone. Intelligence improved. Grew 4 in. (For three years previously had grown only 2 inches.)
Bramwell. Br. Med. Jour., 1894, i, p. 6.	F.	16¼ yrs.	Not stated.	Typical. Idiotic. Height, 29½ in.	6 mos.	Extract and tabloids.	Œdematous symptoms disappeared. More intelligent. Grew 6½ inches.
Comby. Méd. Enfant., 1894, i, p. 578.	F.	2 yrs.	6 mos.	Characteristic appearance. Cannot walk or talk.	15 days.	Raw gland.	Improvement.
Crary. Am. Journal Med. Sciences, 1894, p. 529.	F.	5 yrs.	3 mos.	Characteristic appearance. Dwarfed, lordosis, impaired intelligence.	2½ mos.	Extract.	Great improvement mentally and physically.
Garrod. Br. Med. Jour., 1894, ii, p. 1112.	F.	8½ yrs.	Not stated.	Characteristic.	1½ yrs.	Not stated.	Lost cretinoid appearance. Grew 5 inches.
Lendon. Aust. M. Gaz., 1894, p. 154.	F.	12 yrs.	Not stated.	Height, 32 in. Weight, 25 lbs. Loss of sphincteric control.	17 days.	Hypodermic injections of extract.	Improvement—then fever, bronchitis, and death.
Ibid.	F.	18 yrs.	Not stated.	Height, 3 ft., 3¾ in. Growth in six years only 2¾ in.	9 mos.	Not stated.	Grew 4⅜ inches.
Northrup. N. Y. Medical Jour., 1894, 60, p. 505.	F.	9 yrs.	8 yrs.	Characteristic. Idiotic.	80 days.	Extract.	Much improved.
Ibid.	Not stated.	12 yrs.	Not stated.	Characteristic.	Not stated.	Not stated.	Results not marked.
Osler. N. Y. Medical Jour., 1894, 60, p. 505.	M.	3 yrs.	Not stated.	Characteristic. Could not walk or talk.	14 mos.	. . . . .	Œdematous symptoms all disappeared. Walks and talks. Grew 4 inches.
Ibid.	M.	19 yrs.	Not stated.	Not stated.	. . . . .	Treatment not systematically carried out.	No material gain.
Railton. Br. Med. Jour., 1894, i, p. 1180.	M.	14 yrs.	Not stated.	Characteristic. Idiotic. Height, 33 in.	11 mos.	Raw gland and tabloids.	Œdematous symptoms disappeared. Cannot talk well. Grew 3 inches.

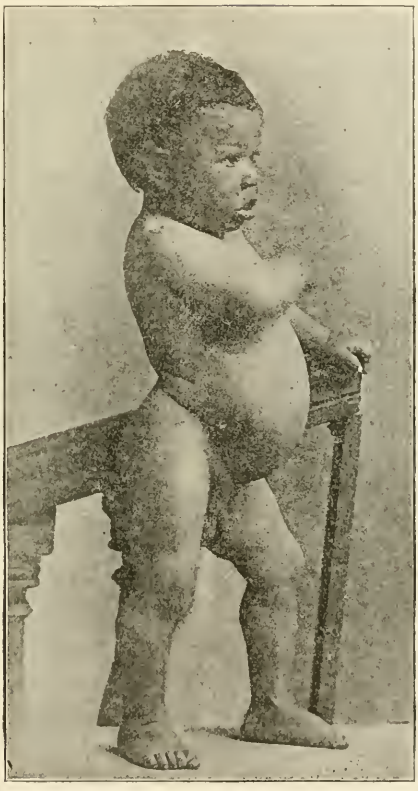
TABLE OF PUBLISHED CASES OF CRETINISM TREATED BY THYROID ADMINISTRATION.

(*Concluded.*)

AUTHOR AND REFERENCE.	SEX.	AGE AT BEGINNING OF TREATMENT.	DURATION OF DISEASE.	SYMPTOMS.	DURATION OF TREATMENT.	CHARACTER OF TREATMENT.	RESULTS.
Smith. Br. Med. Jour., 1894, i, p. 1178.	M.	9 yrs.	7 yrs.	Not a severe case.	9 mos.	Raw gland and tabloids.	Improvement.
Thomson. Edin. Medical Jour., 1894, Feb., p. 720.	M.	18 yrs.	16 yrs.	Characteristic. Mind that of a child of 3 years. Height, 33½ in. Waddling gait.	12 mos.	Raw gland.	Some toxic symptoms. Skin grew softer and mind became brighter. Grew 4¾ inches. Most improvement at first.
Escherich. Wien. med. Woch., 1895, p. 350.	F.	6½ yrs.	4½ yrs. (?).	Myxœdematous symptoms not marked. "A backward child."	6 mos.	Raw gland of calf.	Grew 13 centimetres.
Lebreton. Gaz. Méd. de Paris, 1895, No. 1, p. 8.	M.	13 yrs.	12 yrs.	Characteristic. Idiotic.	Not stated.	Raw gland, slightly browned.	Dentition appeared. Growth resumed. Nothing said of intelligence.
Lebreton. Gaz. Méd. de Paris, 1895. No. 3, p. 31.	M.	3 yrs.	1 yr.	Characteristic.	1 yr.	Dried gland.	Improved.
Sinkler. Int. Medical Mag., 1894-'95, iii, p. 785.	F.	4 yrs.	3¼ yrs.	Characteristic. Unable to walk, talk, or understand. Height, 30¼ in.	3 mos.	Extract.	Œdematous symptoms mostly disappeared. Became more intelligent and began to talk. Grew 2¼ inches.
West. Arch. of Ped., 1895, p. 348.	F.	17 mos.	Congenital.	Stupid. Height, 23¼ in. Weight, 14½ lbs. No teeth.	6 mos.	Desiccated extract. Glycerin extract.	Œdematous symptoms disappeared. Eight teeth. Grew 4 inches. Intelligent.
Fruitnight. Arch. of Ped., 1896, p. 143.	M.	4 yrs.	3 yrs.	Cannot walk or talk. Height, 25 in. Weight, 16½ lbs.	1 mo.	Dried gland.	Grew thinner and more intelligent.
Noyes. N. Y. Medical Jour., 1896, 68, p. 334.	F.	2 yrs.	1 yr., 10 mos.	Characteristic. Height, 21 in.	4½ mos.	Tablets.	Œdematous symptoms gone. Intelligence improves. Begun to creep. Grew 8 inches.
Parker. Br. Med. Jour., 1896, i, p. 333.	F.	6½ yrs.	Congenital (?).	Typical.	12 mos.	Tabloids.	Œdematous symptoms disappeared. Learned to walk. Did not learn to talk.
F. Peterson and P. Bailey, Ped., May 1, '96.	M.	18 mos.	(?)	. . . . .	10 mos.	One grain extract daily.	Probably cured.
Ibid.	F.	15 yrs.	(?)	. . . . .	3 mos.	One grain extract daily.	Great improvement.
Vinke. Med. News, 1896, 68, p. 309.	M.	6 yrs.	Congenital	Characteristic appearance. Can walk and talk a little.	5 mos.	Tablets.	Marked improvement in all symptoms.

Cretin child under treatment by thyroid about two years in an intermittent and rather unsatisfactory manner, afforded clear proof of the value and potency of the treatment. Every time it was begun the child underwent a rapid and striking improvement; every time the treatment was neglected the child relapsed into its former cretinoid appearance, although it never became so bad as it was at first. Finlayson (Glasgow Med. Jour., May, '96).

Case of a child, 5 years of age, seven inches below the normal height at the beginning of treatment, who grew five more; made very ill, hot, feverish, restless, parched, and thirsty. During the third week she lost one and one-half pounds more, and became still brighter and quicker. Both physical and mental improvement during the first six months. W. Rushton Parker (Brit. Med. Jour., June 27, '96).



Case of typical sporadic cretinism. Appearance when treatment was begun. After eighteen months' treatment he had grown nine inches and the mental condition had improved correspondingly. (*Vinke.*)

Case of a cretin, nearly 18 years old. so stunted as to be easily mistaken for a child aged 2 or 3 years; she could not stand or walk or speak. On October 15th she began taking half of a 5-grain thyroid tabloid daily, and within the first week she became much brighter and quicker in noticing things; she also lost one and three-fourths pounds. During the second week she lost two pounds and three-fourths inches in the first year of treatment, four and one-fourth inches in the second year, and two and one-half inches in the third year. In two adult cretins, 36 and 39 years of age, the growth in one was three-fourths of an inch and five-eighths of an inch in the first and second years, and none in the third. J. Thomson (Brit. Med. Jour., vol. ii, p. 618, '96).

During thyroid treatment the rapid growth of the skeleton leads to a softened condition of the bones, which results in a yielding and bending of those which have to bear weight; as cretins under treatment become more active and inclined to run about, this tendency to bending has to be guarded against. If any bending of the bones of the legs appears, the child should not be allowed to walk for a time, or the legs should be supported by light splints. The diet should be generous, and the child should get plenty of sunlight and open air. The administration of codliver-oil and Parrish's food would probably prove beneficial at the same time. T. Telford-Smith (Lancet, Oct. 2, '97).

Cretins whose bones show signs of softening should be kept lying down as they would be in ordinary rickets. Victor Horsley (Brit. Med. Jour., Sept. 25, '96).

Case in which all the symptoms of infantile myxœdema were present: idiocy, dwarfism, absence of the thyroid gland, retarded dentition, pachydermic dentition, etc. Effects of thyroid treatment remarkable. Suspension of treatment: reappearance of almost all symptoms. Treatment was resumed and child transformed physically and intellectually. Bourneville (Le Prog. Méd., Mar. 6, '97).

Three cases improved markedly after taking thyroid three times a day in 1-grain doses; they could be classed with those mentioned by Horsley as being born with but few, if any, signs of the disease, and who gradually become cretins. M. H. Fussell (Med. and Surg. Reporter, Feb. 20, '97).

Three cases in two brothers and sister. The two older marked cretins, the younger being quite a typical case, while the baby has the cretinoid tendency well marked. Thyroid treatment instituted. The baby's present condition is quite that of a normal child. The cases of the two older are less promising as to final results, although they have shown improvement in many ways. C. S. Caverly (Med. Record, Apr. 10, '97).

Fig. 1.

Fig. 2.

Cretin nearly 18 years of age. Fig. 1. Before treatment. Fig. 2. Six months after treatment by thyroid extract. (*Rushton Parker.*)

Four cases of cretinoid myxœdema in which thyroid extract in small doses (2½ grains twice a week) were used with success. It is a great deal better to begin with small doses two or three times a week, even if the desired results are obtained more slowly, than to deluge the patient with it. J. C. Shaw (Brooklyn Med. Jour., Jan., '97).

Case of a child, nearly 8 years old, typical of cretinism, put under desiccated thyroid 1½ grains t. i. d., but, the remedy being administered irregularly, the patient was taken into a hospital. It was then found that 6 grains daily was her maximum dose, and on this amount she very rapidly improved. At the end of four months (seven from the beginning of treatment) she had gained four inches in height, four pounds in weight, and had begun to act like a normal child. Dickson L. Moore (Columbus Med. Jour., Apr. 13, '97).

Case of advanced cretinism in Hindoo boy treated by thyroid extract. Thyroid treatment was begun by administration of 3 grains of the dry extract by the mouth daily. Thyroid enlargement diminished fully two inches in the space of one month; the lad, both physically and mentally, had shown marked improvement. Dose increased to 5 grains daily. Marked and steady improvement continued, but marked absence of patellar reflex,—a prominent symptom in tabes dorsalis, in which Brown-Séquard has used orchitic fluid. Administered to patient 5 grains of didymin daily, as well as the thyroid extract. After a fortnight signs of the reflex returned; patient became much stronger on his legs. H. E. Drake-Brockman (Lancet, Oct. 2, '97).

Case of a child who presented a typically cretinoid appearance when first seen in February, 1896, then 5 years old. Mentally deficient. Given one 5-grain tabloid of thyroid extract (Burroughs,

Fig. 1.

Fig. 2.

Case of cretinism. Result of four months' treatment. Growth, 4 inches. Intellect approaching normal. (*Moore.*)

Wellcome & Co.) daily, which raised the temperature to 102° F.; dose reduced to one-half. Gradual improvement. Weight fell at first to twenty pounds, and then slowly increased, the cretinoid aspect disappeared, and the intelligence steadily improved. Continued to take smaller quantities of the extract, and has developed into a healthy child, weighing thirty-seven pounds, and measuring thirty-seven and one-half inches in height. No thyroid gland could be detected on palpation. W. Carr (Brit. Med. Jour., Nov. 13, '97).

Case of a girl, aged 10 years, who first came under observation in June, 1897, and had not previously been treated with thyroid gland. She was then 9½ years old, weighed thirty pounds, and was two feet and ten inches in height; legs short, with lordosis and prominence of the abdomen. She was in the second standard at school. During four months of thyroid treatment grew two and one-half inches, fatty masses disappearing from her neck. Expression lively and intelligent. W. S. Coleman (Brit. Med. Jour., Nov. 13, '97).

Case with numerous abscesses which healed as soon as the child was put under the thyroid treatment. Hæmoglobin increased from 25 to 75 per cent., child not having done well on the daily doses of from ¼ to ½ grain of the thyroid extract, this attributable not only to the small doses of the thyroid, but to the use of a bad preparation.

Case, in which cold hands showed weak circulation, greatly improved when the preparation was changed. It seemed that the dose must be increased as the child grew older. These children should be kept upon the largest doses of thyroid they will stand without having an elevation of temperature. H. Koplik (Pediatrics, Nov. 15, '97).

Case of cretinism, after two years of treatment, very remarkably improved. During the first year of treatment an attempt was made to keep the child on as large a dose of the thyroid extract as possible. It was found after trial that the child did best on 1 grain a day. After nine months 1½ grains (Parke, Davis & Co.), twice a day. During the first year of treatment she grew eight and one-fourth inches and gained fourteen pounds,—*i.e.*, nearly doubled her weight. After she had been under treatment a year the thyroid was stopped, and during that time the peculiar appearance of the cretin returned and she became much more stupid. She was then put back on 1½ grains a day, and this was kept up until the first of this year. Since then she has had 1½ grains twice a week, on alternate weeks. J. P. West (Pediatrics, Nov. 15, '97).

In sporadic cretinism the fresh thyroid gland, the desiccated gland, and even the colloid substances have been found almost equally efficacious. The preparation used should be free from decomposition-products. Half a grain of the desiccated gland may be at first given two or three times a day, the dose increased in a week or two to 1 grain, and later this may be increased if improvement is not satisfactory. If unpleasant effects result, the dose should be lessened or a fresh preparation tried. A. McPhedran (Canadian Jour. of Med. and Surg., vol. iv, p. 275, '98).

Mental Development Following Treatment with Thyroid.—The alteration in the mental condition is noticed within a couple of months. The patients look much brighter and the face is not absolutely expressionless. As a rule, the younger the case, the more marked is the mental change. Young cretins who have not learned to speak a word soon begin to talk in their play. In children between six and ten the effects are even more remarkable, and with the loss of the myxœdematous condition there is a corresponding awakening of the mental faculties. In older patients the treatment is not so efficacious. (Osler.)

A grain of the desiccated gland three times a day in young cretins is the dose preferred by Osler, but, as already stated, its effects should be carefully watched and the amount reduced if the pulse be-

comes more rapid or if there is fever. Older patients may take as much as 5 grains in the day, and the amount may be diminished as the symptoms indicate. Young patients bear the remedy very well, and in a few months, if no improvement is noted, larger doses must be tried, without, however, relinquishing watchful care.

Literature of '96-'97-'98.

Case of cretinism in a girl, 14 years of age, in which the thyroid-gland treatment was instituted and followed by a very slow improvement mentally and a much more marked one physically. After undergoing the treatment at irregular periods during about nineteen months, her temperature suddenly rose to 104° F., her pulse to 160, and respiration became so short and thick that it was only with difficulty they could be counted. At this time she was taking 6 grains of thyroid extract daily. Medication was immediately stopped, but her condition remained the same, with one remission of temperature and pulse-rate, during two days, when, on January 22d, at one o'clock in the afternoon, she died. S. H. Friend (Med. News, Dec. 4, '97).

Unpleasant effects are less commonly seen than in the myxœdema of adults. After the disappearance of the myxœdema and the establishment of the processes of growth and development, a very moderate dose seems sufficient: 1 or 2 5-grain tablets a week. Osler has noticed that an intermission for a month or six weeks does not seem to be followed by any striking change, but an intermission for a longer period is followed by symptoms indicating a relapse. This is clearly shown in the cases quoted above.

Thyroidin has proven of value and might be used instead if, for any reason, the more reliable preparations cannot be employed.

Literature of '96-'97-'98.

Case of cretinism successfully treated with thyroidin, in a girl of 11 years, who first manifested symptoms of her condition at the age of three years. Her mental condition was of a very low type. Two and one-half grains of thyroidin were given every other day, increased to 5, and still later to 7½ grains every day. The improvement was rapid from the beginning of the treatment, growth and mental development keeping up with the general progress. C. M. Anderson (Lancet, Oct. 2, '97).

Prevention of Cretinism.—The cases observed by Gordon Paterson would tend to demonstrate that the administration of thyroid extract during pregnancy to a woman who had previously given birth to cretins would so modify her physiological functions as to render her capable of bringing forth normal children.

Literature of '96-'97-'98.

Treatment of a mother in her third pregnancy, from the beginning of the third month, who had given birth to two cretins in successive pregnancies. One tabloid taken every day during the remaining seven months of the pregnancy. At no time did she suffer from any discomfort; on the contrary, was much better throughout than she had been in the previous pregnancies. The child was a fine, healthy female, indistinguishable from any other infant in appearance. At the age of 5 months, the infant is remarkably fine and intelligent and can sit up finely. She is now able to stand and to say several words and is 11 months old. A. Gordon Paterson (Lancet, Oct. 2, '97).

Cutaneous Diseases.—The hopes at first entertained have been, to a great degree, dispelled by the results obtained. In psoriasis thyroid extract has not shown itself as effective as other forms of treatment. In lupus and leprosy, in-

dications would seem to warrant further trial. The same might be said of keloid.

According to Don, who used thyroid gland with advantage in cases of ichthyosis, there is no doubt that it is strongly stimulating by directly increasing the cutaneous circulation, as evidenced in sensations of flushing, hot tingling, and congestive irritation, frequently felt as a precursor to ordinary perspiration. The increased cutaneous vascular supply apparently results in: 1. Increased nutrition of the skin; hence its probable remedial action in ichthyotic conditions: an effect produced without any necessary abnormal perspiration. 2. Increased action of the cutaneous glands, accelerating excretion of waste products, thus keeping the surface in a supple condition. 3. Regrowth of hair, as shown in myxœdema and some cases of general alopecia. 4. Increased activity of the epidermal layers, causing desquamation of unhealthy epidermis and reproduction of a new covering, as observed in ichthyosis, psoriasis, dry chronic eczema, and also in some cases of myxœdema and cretinism.

In other diseases, however, in which the remedy was employed the results have been such as not to warrant further trial. Indeed, the untoward effects sometimes attending its administration and the uncertainty of the results have caused many dermatologists to abandon its use altogether.

> As to the effects observed in patients with cutaneous affections, there was generally a considerable increase in the amount of urine and of urea excreted, while the pulse-frequency was often increased by ten or twenty beats. Disagreeable symptoms were seldom observed; when seen, they consisted in great frequency of pulse, palpitation, headache, faintness, tremors, and sweating. Zum Busch (Dermatol. Zeitschrift, Sept., '95).

Literature of '96-'97-'98.

> The use of thyroid extract is only permissible when the patient can be kept constantly under observation, because of the severe and sometimes dangerous symptoms which it produces. Zarubin (Archiv f. Dermat. u. Syph., B. 37, H. 3, '96).
>
> The thyroid extract has certainly no specific action in scleroderma, as it has in myxœdema. In no case did the skin of the affected regions become softer or regain its natural appearance. In two cases the disease did not progress under its use. Two of the cases—one with tachycardia—took it for eighteen months, and another for nineteen months, without any ill effects; the latter case gained weight. W. Osler (Jour. of Cut. and Genito-Urin. Dis., Mar., '98).

Psoriasis.—Of all the skin affections psoriasis is the only one in which thyroid extract seems to have proven beneficial in a reasonable proportion of the cases in which it was used. But at best its effects are not to be relied upon, and it should only be tried after arsenic and other standard measures have been fully tried.

> Results in twenty cases of psoriasis: In a very considerable proportion of cases the thyroid treatment produces a temporary cure, the eruption entirely disappearing and the skin being left in an absolutely healthy condition. In exceptional cases small doses produce a rapid improvement, while in others improvement is only produced after distinct symptoms of thyroidism. Some obstinate cases ultimately yield to very large doses, continued for a long time.
>
> No case should be regarded as hopeless unless thyroidism has been produced, the largest dose which the patient can take having been continued for at least two months. In several cases the first effect of the remedy is to produce an extension of the eruption, this being most marked in cases in which the treatment is most successful. In some cases the treatment produces no effect. Relapses are not prevented. Long-standing, chronic cases

are more readily cured than the more recent ones. Treatment begun with small doses and increased until distinct symptoms of thyroidism are produced. Byrom Bramwell (Jour. of Dermatology, July, '94).

Twenty-four cases of psoriasis, eleven of which were cured and seven were improved by the treatment. In a few cases even tolerably large doses seemed to have hardly any effect. It does not seem at present possible to distinguish beforehand those cases of psoriasis which are benefited by the treatment from those which derive no benefit. Zum Busch (Derm. Zeit., Sept., '95).

Four cases of psoriasis treated by thyroid extract, in the form of pastilles. Two daily, equivalent to one thyroid gland, were given. One of the patients took thyroid gland daily. In none of the cases did any improvement result from the use of the medicament. The ingestion of a thyroid gland in one case produced a febrile condition, nausea, and diarrhœa, without any manifestations of acute dermatitis. Menau (l'Encéphale, June 10, '94).

Desiccated thyroids used in the treatment of three cases, one of which was cured in about two months. The remaining two were benefited only to a slight extent. The dose ranged from 3 to 15 grains three times a day. Cantrell (Ther. Gaz., Sept., '94).

Cases successfully treated by thyroid extract. Wilson (Brit. Med. Jour., Feb. 16, '95); Preece (Brit. Med. Jour., Mar. 30, '95); See Annual, '96.

Disappointed with the effect of thyroid in psoriasis. Althought some of the cases treated had been benefited in a marked manner, the majority had not. Even in the cases that had been improved equally good results, with much less disturbance of the patient's health, would have been achieved by the vigorous use of external remedies, such as ointments and baths. P. S. Abraham (Med. Press and Circular, Jan. 2, '95).

Case of psoriasis palmaris treated with thyroid extract, 5 grains three times a day. At first nausea and slight indisposition, and eruption more marked. Changed to powder (equal to one-sixteenth of a fresh gland) three times a day. After three weeks downy hair growing on both forearms which had been previously quite devoid of hair; no sign or trace of eruption in left palm; skin normal. Charles Forbes (Med. Press and Circular, July 24, '95).

Experiments upon eleven men affected with typical psoriasis of the common form. Thyroid gland itself was administered, fresh and uncooked, cut into thin slices, and given in a warm broth. In three patients there was no alteration whatever. In the remaining eight there was a manifest improvement, which showed itself by a diminution in the extent and intensity of the redness, in the size, thickness, and color of the scales, which became reduced, the large patches seeming to break up into a large number of small papular elements, more or less isolated, each covered with a small, independent squama. Some disappeared, the seat of the former lesions being only indicated by a reddish-brown or brown spot, which gradually faded until the skin resumed its normal color. Thyroid ought only to be tried where other methods of treatment have failed to bring about a good result. Thibierge (La Semaine Méd., Aug. 17, '95).

On the whole, use of thyroid tabloids has been disappointing; nevertheless, great improvement noted in certain cases. Cannot compete with arsenic. Jonathan Hutchinson (Med. Press and Circular, July 3, '95).

Thyroid treatment has a limited sphere of usefulness; unsuited for elderly patients with weak hearts. Radcliffe-Crocker (Lancet, June 8, '95).

Literature of '96-'97-'98.

Thyroid extract used in psoriasis in six cases, in only one of which it was successful in curing the disease. H. S. Purdon (Dublin Jour. Med. Sciences, Nov. 2, '96).

Lupus.—In lupus vulgaris thyroid has not been extensively tried, but the benefit derived in a number of cases, and the unfavorable results attending other forms of treatment, warrant fur-

ther investigations. Large doses are required.

Two cases in which thyroid extract was used: In the first, a girl aged 16½ years, whose disease had persisted for nine years, covering the nose, left cheek, and upper lip, and extending from each corner of the mouth to the chin, administration of the extract was continued, with a few intervals, during six months. At the latter date the improvement was marked. In an intermission the disease retrograded, but improved again on the resumption of the thyroid treatment. After a year the patient was much improved, not cured. The second was a girl, aged 18 years, whose nose, mouth, and right eyelid were affected. Noticeable improvement was made within a month. Byrom Bramwell (Brit. Med. Jour., Apr. 14, '94).

Cases in which treatment by thyroid extract proved beneficial, but not curative. Abraham (Brit. Jour. of Derm., Aug., '94); Lake (Jour. of Laryn., Feb., '95).

Case of lupus vulgaris treated with thyroid extract and linear scarification. Face wonderfully improved. On passing the finger over the lupus it is found to be perfectly smooth and the ulceration apparently healed. G. G. Stopford Taylor (Med. Press and Circular, Oct. 3, '94).

Four cases where the results had been extremely good. P. S. Abraham (Med. Press and Circular. Jan. 2, '95).

Thyroidin appears to cause local reaction somewhat resembling that caused by tuberculin. Zum Busch (Derm. Zeit., Sept., '95).

Literature of '96-'97-'98.

Duration of treatment necessary to insure permanent cure, even with full doses given regularly and continuously, not shorter than one year. The dose in lupus, as in psoriasis, requires to be larger than what is found sufficient for myxœdema. The older the patient, the more cautious ought we to be with the quantity prescribed. J. Barclay (Brit. Med. Jour., Oct. 24, '96).

Two cases of lupus in which the results were very successful. In both cases there was no bad symptom. The points to be noted are preliminary scraping, the gradual increase in the amount of the drug, and the large quantity taken, as much as 90 grains a day in one case. Seen eight months later: in one case there was a tiny focus in the interior of the nose, and in the other there was no return whatsoever. F. G. Proudfoot (Brit. Med. Jour., Jan. 2, '97).

Leprosy. — Closely associated with lupus is leprosy, in a few cases of which thyroid gland has been tried. The results, though promising, do not warrant even an estimate of its value, and it is hoped that its merits will be further investigated.

Tried tabloids on the Trinidad Leper Asylum patients. Results not encouraging. The most powerful preparation of the drug had been pushed as far as safety would allow in leprosy. Bevan Rake (Med. Press and Circular, Jan. 2, '95).

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Two cases of leprosy treated by thyroid gland; beneficial influence on both. Patients seen two years later and found apparently well and able to earn their living. The disease had not advanced. C. B. Maitland (Lancet, Oct. 31, '96).

Keloid.—Thyroid extract has caused disappearance of the hypertrophic tissues in a case reported by J. W. White.

Case following cut in which absorbent ointments, pressure by means of plaster, and other means of local treatment having been tried to no purpose, put upon thyroid extract, from 2 to 4 tablets—each tablet containing 5 grains—being given daily. All local treatment discontinued, the scar covered with a film of collodion to prevent abrasion of irritation and to keep up gentle pressure. In a few weeks a perceptible change noted; in six weeks the scar had, in almost its entire extent, come down to the level of the surrounding skin and the dense base had disappeared. J. W. White (Univ. Med. Mag., Aug., '95).

Epilepsy.—The four cases given below would tend to show that thyroid gland is of no value in this disorder.

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Cases selected for trial those in which many congenital defects were noticeable, and in which epilepsy had been a prominent feature of the patient's life since early infancy. The administration of thyroid not attended with very good results. While all seemed to be benefited for the time being, permanent improvement doubtful. Trial subjects lost from three to ten pounds in weight. The results would not seem to justify its continued use in epilepsy, and its further administration was not attempted. L. P. Clark (Med. Record, Oct. 24, '96).

Exophthalmic Goitre. — In the treatment of this condition the various preparations of thyroid have been found more harmful than beneficial in many cases.

This would seem to sustain the opinion expressed by M. Allen Starr, that if exophthalmic goitre is due to hyperactivity of the thyroid gland—a theory first proposed in 1886, and which has gradually gained ground since then—there is every reason why the thyroid treatment should be avoided. The few cases of reported improvement from this treatment would not, in his opinion, bear critical investigation.

It is probable, however, that in certain cases thyroid gland may prove of value, as shown in some of the instances reported below, and that we are as yet insufficiently informed to determine just where the remedy is applicable. It should certainly not be employed indiscriminately, and judging from a review of recent reports as a whole the condition of the heart would seem to influence the action of the remedy.

In Graves's disease thyroid treatment contra-indicated. It is possible, however, that when the goitre seems to be the primary trouble some benefit may be derived from this agent. Senator and Mendel (Berl. klin. Woch., Feb. 3, '95).

Three cases in which good results were obtained. Voisin (Revue de Thérap., p. 728, '95).

Nine cases, all markedly improved. In the majority the improvement was slow, though steady, but in only one did the exophthalmos disappear. Bogroff (Gaz. Heb. de la Russie Mérid., Jan., Feb., '95).

Thyroid has no favorable influence, and is, indeed, likely to increase the discomfort, or, where the symptoms had abated, to light them up again. Stabel (Berliner klin. Woch., Feb. 3, '95).

Successful case after the use of a quarter of a lobe eaten raw twice a day. Fergusson (Brit. Med. Jour., Oct. 20, '95).

Case in which 1½ to 2 drachms of sheep's thyroid daily before meals, small amounts of gland daily, then omitting use for ten days every three weeks, caused all symptoms to disappear except slight swelling and slight exophthalmos. Voisin (La Sem. Méd., Oct. 24, '95).

Case by thyroid extract, with improvement at first, followed later by deterioration. The thyroid extract was reduced, then stopped, but the patient died three weeks later. There was great proliferation of the thyroid epithelium. H. Power (N. Y. Med. Record, Aug. 11, '94).

Cases in which the remedy aggravated the active symptoms. Dreyfus-Brisac and Béclère (La Sem. Méd., Oct. 24, '95).

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Patients who have been treated with thyroid extract prior to operation seem to be more liable to heart-failure both during and after this proceeding, and one or two deaths have been attributed to this cause. Angerer (Münchener med. Woch., 21, '96).

Four cases showing that, while thyroid extract has certainly accomplished a cure in two of the cases, the indications are strongly against its indiscriminate use in exophthalmic goitre. It

acted beneficially in the two cases and injuriously in the two others. Its cautious exhibition, in proper cases, however, is not to be discouraged. Henry L. Winter (Amer. Medico-Surg. Bull., July 11, '96).

Case of woman, 40 years old, who had been treated unsuccessfully with arsenic. The action of the heart was tumultuous and the pulse-rate was 160. The tremor in the hands was so pronounced as to prevent the patient's continuance of work as a sewing-machine operator. The woman received from a friend 120 tablets of thyroid extract, each of 10 grains, and took six of these daily. After the lapse of three months the patient appeared almost entirely well. Slight struma was still discernible, but exophthalmos and Graefe's sign had disappeared; the pulse ranged from 90 to 96; the tremor in the hands was absent; and the roaring over the heart was no longer apparent. The patient herself felt perfectly well. Silex (Berliner klin. Woch., No. 6, '96).

Case apparently much benefited by the administration of thyroid extract. The case had existed for a number of years, and thyroid enlargement has been quite distinct. After the thyroid extract had been given for about a week, the pulse had dropped from 110 to 80, and ever since then the patient has been much more comfortable. It was necessary, however, to take thyroid every few months. There had been no return of the enlargement except for a few days, while the patient had had a cold. Hallock (Jour. Nerv. and Mental Dis., June, '96).

In fifty-one cases of exophthalmic goitre, treated by the thyroid extract. the size of the gland has been diminished, but the other symptoms have not been relieved. Crary (Jour. Nerv. and Mental Dis., June, '96).

Case made very much worse by the thyroid extract. Leszynsky (Jour. Nerv. and Mental Dis., June, '96).

A case of exophthalmic goitre successfully treated by thyroidin. Owing to anorexia and nausea, was obliged to suspend the treatment three times, and to reduce the dose, but after about sixty days all signs of the disease had disappeared. A year later the patient was well, cheerful, and bright, and her menstrual functions are regular. R. M. Whitefoot (Med. News, Oct. 3, '96).

Case of a girl of 13 years whose father had been an epileptic and whose sister had died of tubercular meningitis. Marked exophthalmos; pulse, 140; thyroid gland perceptibly enlarged. Usual means having failed, resort had to desiccated thyroid, 5 grains after meals. After two days considerable relief. On the ninth day the powders gave out and in two days the pain returned. After five months of treatment, exophthalmos and thyroid enlargement greatly reduced, and patient comparatively well. Kerley (Pediatrics, June 1, '97).

Thyroid extract given in case of exophthalmic goitre in which sudden swelling of the gland was so severe as to interfere with breathing; also in a case of acute thyroiditis. In both cases the swelling subsided and symptoms were relieved. J. Eliot (Va. Medical Semi-monthly, June 28, '98).

Goitre.—In simple goitre the preparations of thyroid prove effective in about two-thirds of the cases, the results ranging from total disappearance of the goitre to a noticeable reduction in its size. Children and young adults are benefited in the great majority of instances. A favorable result is seldom obtained in adults. Increasing doses seem to procure the most satisfactory effects. The influence of the remedy is felt after the first three or four days in successful cases, and, in a month or so, the reduction of an average tumor will generally have been effected. In order to keep the goitre from returning, the administration of the remedy must be continued, the preparation being given in reduced quantities and at longer intervals.

The results have been practically the same whether fresh or desiccated glands or extract were employed. Its admin-

istration should be carefully watched, however, and the dose reduced upon the appearance of any untoward symptom.

Among twenty-one cases of goitre, in eleven, of from 2 to 17 years of age, there was considerable diminution, but not complete disappearance, of the tumor; in five, from 12 to 21 years of age, the amelioration was slight, and in five cases there was no result. Knöpfelmacher (Wiener klin. Woch., Oct. 10, '95).

Six insane patients with goitre treated surreptitiously, using raw thyroid from the sheep, 1½ or 1¾ drachms concealed in slices of sausage in a sandwich, repeated in ten or fifteen days. In five cases there was an appreciable diminution in the size of the goitre after each ingestion of thyroid. No untoward symptoms. Emminghaus and Reinhold (Les Nouveaux Remèdes, No. 18, '94).

Sixty cases of benign parenchymatous goitre, without selection, treated with thyroid tabloids, 2 daily to adults, 1 to children. Duration of treatment from three to four weeks, on the average. In young children complete recovery the rule. In adults recovery rare and less common in proportion to age. Complete return of thyroid to normal size not to be expected later than twentieth year. Bruns (Amer. Jour. Med. Sciences, May, '95).

Cases treated by desiccated thyroids. Size rapidly reduced, though treatment not maintained for a sufficient time to establish final recovery. Remedy not free from danger if given in unlimited quantities and over too great a length of time. Illustrative case. E. Fletcher Ingals (Medicine, Aug., '95).

[In a case of goitre under my care, in which thyroid tablets were given, the latter had to be discontinued on account of untoward symptoms: accelerated and weak pulse with tendency to syncope, accelerated respiration with dyspnœa, increased diuresis, and, also, pronounced anorexia, which disappeared upon the withdrawal of the thyroid extract. C. Sumner Witherstine, Assoc. Ed., Annual, '96.]

Warning against too sanguine views as to success of thyroid treatment. Kocher (London Lancet, July 20, '95).

Nineteen patients treated with tablets, but in no case did the goitre disappear entirely. The gland sometimes became smaller, but not unless the patient was young, and the effect was only temporary. Ewald (Berliner klin. Woch., Feb. 3, '95).

Ninety-three patients treated partly with an extract of fresh thyroid glands of wethers and partly with thyroid tablets. In twenty-five cases glands of freshly slaughtered animals reduced to a pulp and mixed with water were used exclusively, the average quantity taken by a patient in a week being 5 drachms, although in some cases it rose to 9 drachms. In the hot season the patient complained of slight gastric troubles, which, however, disappeared as soon as the thyroid preparation was preserved in ice. There was only one instance in which the treatment had to be discontinued on account of its disagreeing with the patient. The thyroid gland regained its normal dimensions in only four of the twenty-five patients treated in this way, and in only two of these four was the good effect permanent, for the other two had a relapse after the expiration of a month. In all the other cases there was an obvious reduction in the size of the gland, and with two of the patients this was permanent, but it generally began to swell again whenever the treatment was stopped. The frequency of the pulse was a little augmented, but never so much as to make an interruption of the treatment necessary. A number of patients after having taken the fresh glands for several weeks were then treated by tablets. In another series these tablets were used from the beginning of the treatment. The results were much less satisfactory. Stabel (Berliner klin. Woch., Feb. 3, '95).

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Nine children suffering from parenchymatous goitre healed with Merck's tabloids containing 5 grains of thyroidin.

Children under two had from ½ to 1 tabloid daily during the first week, and from 1 to 2 tabloids daily afterward;

older children, after the first week, as many as 4 or 5 tabloids allowed daily. Marked diminution in the size of the gland, the improvement commencing after about three days' treatment and reaching its maximum in three weeks.

In all the cases treated the rapidity of the heart's action was increased; but, on the discontinuance of treatment, the action again became normal. Cautious use of the drug advised, beginning with small doses, and gradually increasing them. If the heart's action becomes irregular, suspension of treatment. Dobrowsky (Arch. f. Kinderh., B. 26, '96).

Seventy-eight cases treated with thyroid. In all the cases in which the treatment was tolerated and continued for several weeks, diminution of the goitre was attained. Best results noticed in the soft, simple, hyperplastic goitres, especially in those occurring about the age of puberty. Cystic goitres became more superficial through the atrophy of the hyperplastic tissues, and their enucleation was facilitated. Angerer (Münchener med. Woch., p. 93, '96).

Thyroid gland is best adapted for the form known as struma parenchymatosa. Definite cure is rarely observed and only in young subjects. The results are satisfactory in 63 per cent. of cases, the goitre lessening in size. In 30 per cent. of the cases the treatment is absolutely valueless. When goitre has undergone secondary degenerations, such as colloid or cyst- formation, the treatment is useless. Sérafine (Revue de Thér., July 15, '97).

Case of weak, cachectic newborn infant presenting a marked bilobed goitre. The mother, herself goitrous, was in excellent health, but mentally weak. The treatment of the mother consisted in daily administration of 22 1/2 grains of thyroid body. At the end of one month and a half her goitre had almost totally disappeared, and in the infant the cure was complete. Mossé (Revue Men. des Mal. de l'Enfance, June, '98).

Insanity.—It is in melancholia and the mental disorders connected with the menopause that thyroid extract finds its greatest usefulness. In recurrent mania, delusional insanity, excellent results have also been reported. MacPhail and Bruce consider its use dangerous in cases of acute mania and melancholia where there are rapid loss of body-weight and malassimilation of food; also in cases where there is active phthisis or valvular disease of the heart. The profound effects of the drug on the circulatory system render it imperative that during treatment, and for at least a week afterward, the patient should be rigorously confined to bed.

Osler is of the opinion that the cases of insanity in which thyroid extract proved beneficial were probably cases in which there was some derangement of the thyroid gland. The pulse ran up under its influence in some cases to 160, but in none had it caused any serious results.

Kinnicutt, in sustaining this view, thinks that the very fact that in a large majority of the cases the treatment is without effect, while now and then it is so strikingly successful, would indicate that in the latter the trouble was probably connected with diminished or perverted secretion or function of the thyroid gland. As in other disorders, the use of thyroid has to be continued after recovery to prevent relapse.

In twenty-five cases internal administration of thyroid induced true febrile process; resulting action beneficial. Specially useful in insanity of adolescent, climacteric, and puerperal periods, and frequently so in cases where recovery is protracted and tendency is to drift into dementia. Bruce (Jour. of Mental Science, Jan., '95).

Four cases of insanity with well-marked stupor where the outlook had become unfavorable, if not hopeless. A decided reaction sought for, and the dose of thyroid regulated by the tolerance of each patient. No benefit in one case; two sufficiently benefited to be

discharged from the asylum, and a fourth materially improved. Cell-nutrition is undoubtedly affected in a striking manner, and increased metabolism occurs as the result of quickened circulation. The autotoxic process, so frequently present in cases of mental disease, is interfered with in a way that may be beneficial. C. K. Clark (Canadian Pract., Oct., '95).

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Cases of post-melancholic hebetude following a lengthy period of depression offer the best prospect of improvement and are more or less influenced in the majority of instances.

Cases of stuporous melancholia of long duration are usually improved by thyroid. Cases which recover appear to have a special predilection to relapse.

Maniacal cases whose attacks have been unduly prolonged give a very encouraging prognosis.

Cases of cerebral exhaustion following acute delirium or stupor whose elimination of urea and other nitrogenous compounds is greatly reduced, offer a fair chance of improvement.

Many cases of chronic mania without fixed delusions may be benefited by a course of thyroid treatment.

In doubtful cases thyroid may assist in clearing up the diagnosis. It will early differentiate between true stupor and dementia. In delusional cases of a doubtful nature a course of treatment will usually show whether delusions are fixed or temporary, as the latter will vary in character or entirely disappear during treatment, while the former undergo no change whatever. W. L. Babcock (State Hosp. Bull., Utica, N. Y., Jan., '96).

Results in five cases. Three of chronic dementia; one was a case of chronic melancholia, and one of puerperal mania. One case of dementia recovered in three weeks and had a relapse in one week, after the drug was discontinued. In another case of dementia the patient was worse physically and no better mentally for treatment, but recovery was complete in ten weeks and the patient remained well. A third case of dementia was rational in two and a half weeks, and well in three weeks. A case of delusional melancholia was completely changed in two and a half months, when the patient seemed to be recovering. The case of stupor following puerperal mania was much improved in less than three months and able to go home and resume her household duties. Charles K. Clarke (Jour. of Nerv. and Mental Dis., Apr., '96).

The early use of the thyroid and treatment of forms of insanity not associated with myxœdema appears to have been based upon observations made in the use of thyroid in other conditions, showing that a mild febrile reaction follows the employment of the gland. It was to induce this febrile reaction that first suggested the employment of the thyroid in non-myxœdematous cases of insanity.

Case characterized by delusions of doubt and fear, especially of fear of contamination, improved. Better control over most of the ideas of contamination.

Case of chronic delusional insanity, violent, untidy, destructive, with rough skin and scanty hair, rapidly improved.

Case of a mild case of simple melancholia with slight enlargement of the thyroid gland; at first more depressed, but now convalescent.

Case with attacks of recurrent maniacal excitement. At first evident elevation of temperature, flushed face, free perspiration, and slight nausea. Patient practically convalescent.

Two cases of chronic melancholia in men in which no improvement was manifest.

Inclined to indorse the views of Bruce, that the thyroid undoubtedly produced a more or less feverish condition, the action and reaction to which are of considerable benefit to the patient. Thyroid is a direct cerebral stimulant, and there is a strong probability that at some periods of life the administration of thyroid supplies some substances necessary to the bodily economy. E. N. Brush (Jour. of Nerv. and Mental Dis., Apr., '96).

One very important function of the thyroid is to stimulate brain-metabolism. We must regard the thyroid extract as

containing a most potent cerebral stimulant which does alter, in some way, the metabolism of the nerve-centres and stimulates them in a most extraordinary manner. William Osler (Jour. of Nerv. and Mental Dis., Apr., '96).

Forty cases, consisting chiefly of commencing senile dementia, acute mania, and melancholia treated with thyroid. Of these eight were unaffected by the treatment, twelve were somewhat and fourteen were much improved, five cured, and one died. The drug had an altogether extraordinary influence on the mental condition of the patients. Among clinical symptoms during the use of the remedy, rise of temperature and pulse-rate, gastric disturbances, increased perspiration and quantity of urine, transient albuminuria in 10 per cent., œdema of face and extremities, cyanosis, desquamation of the skin, sexual excitement,—so that masturbation in three cases necessitated the discontinuance of the thyroid extract,—were observed. C. G. Hill (Trans. Med. and Chir. Fac., Maryland, p. 30, '96).

Merck's dry thyroidin used in fifteen cases of chronic mental disease (secondary dementia); found that (1) the frequency of the pulse invariably increased (sometimes up to 120 per minute, or even more), while the pulse became softer, though remaining fairly strong; (2) in some of the patients there was simultaneously observed a rise of temperature; (3) the body-weight at first decreased, but subsequently, after reaching a certain minimum, remained stationary, and after discontinuing the administration markedly increased; (4) the influence of thyroidin on the patient's mental condition was invariably *nil*; (5) in some of the cases thyroidin gave rise to fibrillary muscular twitchings and increased perspiration; (6) a prolonged administration produced gastro-intestinal disturbance. E. F. Shulansky (Vratch, No. 33, '96).

In conditions marked by inhibition of sensory, motor, and mental activity, without gross organic lesion, such as obtain in katatonia and in certain types of stuporous insanity and melancholia, we may expect benefit from thyroid medication, judiciously used.

The effects of thyroids in full dose bear a striking resemblance to many of the symptoms of Graves's disease, namely: orbicular weakness, consecutive conjunctivitis, skin eruptions and temporary bronzing without icterus of eyes, profuse local fœtid sweats, subjective sense of heat and thirst, excessive metabolism, decided tachycardia, and the absence of any fixed relation between pulse-rate, respiration, and temperature. J. G. Rogers (Amer. Jour. of Insanity, July, '96).

Results of thyroid feeding in twenty patients. The extract, in tabloids of 5 grains each, administered. 1. Melancholia agitata. Four females and one male. The four females were unimproved, the male greatly benefited. 2. Melancholia. Three females and four males. The females and all but one of the males were unimproved. 3. Senile dementia. One female. No improvement under treatment. 4. Chronic mania, Two females. No improvement under treatment. 5. Mental enfeeblement. One female and two males. No improvement under treatment. 6. Dementia. One female and one male. No improvement under treatment. In all cases the pulse was the first to show any change, and was most affected by the drug. Robert Cross (Edinburgh Med. Jour., Nov., '97).

Thyroid treatment of great value in a form of mental disturbance occurring at the climacteric,—a mental depression with anxiety and morbid fears, but without delusions of insomnia. Allen Starr (Amer. Jour. Med. Sci., vol. cxiv, No. 1, '97).

Insane cases in which a pill containing 5 grains of fresh sheep's gland was administered daily, and subsequently increased to two or three according to results. Besides the usual symptoms there was more or less mental or motor excitement in all cases no matter how depressed or demented the patients had been previous to the administration. In some instances there was considerable mental improvement. Berkley (Johns Hopkins Hos. Bull., July, '97).

Results of administration of thyroid extract on the red and white corpuscles and hæmoglobin in cases of anæmia associated with melancholia. In 9 cases thyroid medication was employed and in 5 cases there was a marked change for the better; in the other no favorable influence was noted. In 3 of the 5 in which improvement took place there was increase of weight during the treatment, and in 2 subsequently. The psychological effect was observed almost from the beginning in those in which permanent improvement took place. Samuel Bell (Phila. Med. Jour.; Brit. Med. Jour., July 9, '98).

MYXŒDEMA.—With very few exceptions, cases of myxœdema are always attended by well-marked atrophy of the thyroid gland. That the disease is a result of the absence from the blood of the secretion of the thyroid is a logical conclusion which the use of the gland as a remedy has amply verified. Again, the fact that absence of the gland is the primary factor in the etiology of the disease also makes it plain that unless the secretion which it furnishes the system is replaced continuously the disease will recur after recovery—another fact verified by practical experience, which has shown that small doses of the gland must be administered for years if the recurrence of the myxœdemic symptoms is to be prevented.

As originally recommended by Murray, the treatment should be divided into two stages: (1) removing the symptoms of the disease; (2) maintaining the condition of health attained. The first stage must be carried on gradually, and with care, as the alteration in the patient's condition is so great that, in many cases, it is not safe to bring it about rapidly. This caution applies especially to cases which show signs of cardiac or vascular degeneration. Several such patients have died of syncope brought on by over-exertion, after the symptoms of myxœdema have been much improved. Ten to 15 minims of the extract, twice or thrice a week, may be slowly injected. If flushing of the face or pain in the lumbar region occur, the injection should be stopped. When taken by the mouth from the beginning, daily doses of 5 to 15 minims two or three hours after breakfast have been found best. The changes which take place in the temperature, pulse, weight, appearance, and sensations of the patient are all important in governing the dose. In the second stage, the smallest dose which keeps the temperature up to the normal, or above 97° F., is sufficient. The remedy is given preferably by the mouth in this stage.

When cardiac disorders are present, the dose should be small and the patient kept in the recumbent position, as advised by Bramwell.

The benefits to be derived from thyroid feeding in myxœdema must not make us forget its dangers; thyroid juice poisons the heart and may cause death by syncope. Béclère (La France Méd. et Paris Méd., Jan. 25, '95).

Two deaths, under treatment, of patients with weak heart. F. Vermehren (Centralb. f. Nerv. Psy., etc., July, '93).

The dose should be much smaller when cardiac disorders are present than the usual one. Complete rest in the recumbent position should be enforced from the commencement of the treatment. B. Bramwell (Practitioner, July, '93).

Effect of thyroid extract in myxœdema complicated by angina pectoris beneficial. No discomfort until the twelfth day, when extract discontinued. H. C. L. Morris (Lancet, Sept. 28, '95).

Statistics of one hundred and sixteen cases, with absolute failure to secure improvement in only three, show the value of the thyroid treatment. Reports vary in regard to the degree of improvement

from "cure" to "slight improvement." The latter cases, however, were few in number. (Eskridge.)

The treatment of acquired myxœdema in the adult is almost universally successful. When failure occurs, it is generally in experienced hands or the thyroid itself is not good. For a continuous good result treatment must be maintained, but, as the action of thyroid is cumulative, intervals of cessation, varying in different cases, are necessary. In winter large doses and shorter intervals are necessary than in summer. Feeling of cold an indication to renew treatment. One grain of powder cautiously increased. Meltzer (Amer. Medico-Surg. Bull., July 1, '95).

Good results with thyroid feeding in a desperate case. About 15 grains a day will suffice, and not expose patient to danger. On appearance of headache, vomiting, pain in the kidneys, and increasing pulse-rate all forms of thyroid extract should be discontinued at once. J. J. Schmidt (Deutsche med. Woch., No. 42, '94).

Unmistakable improvement in three cases of myxœdema. Good results from the use of the tabloids containing, each, 5 grains of the extract. Starr (Boston Med. and Surg. Jour., Sept. 27, '94).

Case of a boy, about 5 years of age, who, in the early part of the treatment, took one-fourth of the thyroid gland of a sheep each twenty-four hours. Later on the gland was given him in a desiccated form. In fourteen months the boy grew four inches,—an unusual increase. At the time of the report he walked and ran about, and had gained so much mentally that few would think him abnormal in this particular. Osler (Med. Record, July 21, '94).

Three cases of myxœdema in which fresh thyroid gland was given. Results excellent, but temporary. If moderate doses be given, the symptoms characteristic of goitre can be made to disappear gradually. W. Pasteur (Rev. Méd. de la Suisse Rom., p. 35, '94).

Eleven cases of myxœdema treated by thyroid grafting. Improvement in six and failure in five cases. Kinnicutt (Med. Record, Oct. 7, '93).

Two cases of myxœdema in children, one a girl 9 years old, the other a boy 12 years old, treated with glycerin extract of sheep's thyroid. Improvement. Northrup (Archives of Pediatrics, Nov., '94).

Several children suffering from myxœdematous idiocy, in whom physical and intellectual conditions were greatly benefited by thyroid alimentation. Bourneville (Revue de Thér. Médico-Chir., Nov. 1, '95).

Abuse of this treatment owing to the unrestricted sale of thyroid preparations, and especially tablets, condemned. Restrictions should be placed upon the sale of thyroid preparations. Eulenberg (Deutsche med. Woch., Aug. 15, '95).

[This is a well-timed warning, as thyroid tablets and extract have in them the elements of danger, the early signs of which are not likely to be appreciated by the laity. The dose (1 to 2 tablets three times daily) given on the labels of the original bottles in which the remedy is sold is, in most cases, too large. C. Sumner Witherstine, Assoc. Ed., Annual, '96.]

Case of myxœdema placed on a diet regulated so that its different elements should be, as far as possible, the same each day. At the end of a week treatment with thyroid extract was begun, the diet remaining the same. During treatment the urine was increased in volume; the nitrogen excreted in the urine exceeded the total quantity of nitrogen in the food, and appeared in the urine chiefly in the form of urea. Phosphoric acid and chlorine elimination was practically unaffected. The body-weight was diminished rapidly and the temperature raised. Mental improvement in myxœdematous patients under the thyroid treatment has generally been as marked as the physical. W. M. Ord and E. White (Brit. Med. Jour., July 29, '93).

In a case of congenital myxœdema treated with thyroid, diameter of red corpuscles before treatment began was 3.13 microns; after, it was 7.5 microns. Nucleated red corpuscles disappeared

under treatment. Persistence of a fœtal state of blood seems to coincide with a tardy development of the body. Lebreton and Vaquez (La France Méd. et Paris Méd., Jan. 18, '95).

Sixteen cases of myxœdema treated with thyroid gland, in two of which exact estimates of metabolic processes made, metabolism of proteids found to be excessively small, proteids of food digested in a defective manner; when thyroid ingested, more nitrogen excreted and whole metabolism improved. Vermehren (Univ. Med. Jour., Nov., '95).

Literature of '96-'97-'98.

After-history of the first case of myxœdema treated by thyroid extract. The patient, a woman aged 46, who had suffered from myxœdema four or five years before the treatment was commenced in April, 1891, is still quite free from the disease. On two occasions, when the remedy was discontinued for some time, the symptoms partly returned. She still takes 1 drachm of thyroid extract each week. C. R. Murray (Brit. Med. Jour., Feb. 8, '96).

Priority claimed, as regards giving the thyroid gland by the mouth, for Dr. Howitz, of Copenhagen. Polyuria, rise of temperature, insomnia, and pains in the limbs are signs warning that the remedy should be suspended. Dupaquier (New Orleans Med. Jour., Mar., '96).

Series of cases, some of which had been under continual and regular treatment, others in which the treatment by thyroid extract had been irregular and intermittent. The cases in which the treatment had been continual had lost all the characteristic features of myxœdema, and could no longer be recognized as instances of that disease. Other cases in which the treatment had only been irregularly carried out still presented characteristic features of myxœdema. Myxœdemic patients taking thyroid preparations complained of a great deal of pain in the back or limbs, and that it was worthy of consideration whether those pains might not be of a gouty nature. Thomas Harris (Brit. Med. Jour., Feb. 15, '96).

Case in an adult complicated by hallucinations, melancholia, loss of memory, diminished hearing, and alternating anuria and incontinence, in which general condition and complications were greatly benefited by thyroid extract (5 grains daily). John Woodman (Med. Record, Oct. 31, '96).

Case of a child, aged 5 years, with congenital myxœdema, which had increased perceptibly in height and shown general improvement during two months' thyroid medication. Simon (Med. Record, Sept. 19, '96).

Case of unilateral bronchocele with myxœdema apparently held entirely in abeyance by one 5-grain tabloid of the thyroid extract daily for two weeks. F. D. Merritt (Med. Record, Oct. 17, '96).

Case ordered to take one thyroid tabloid (equivalent to 5 grains of healthy gland) three times a day. Improvement two days after the treatment began, and the amelioration proceeded rapidly, so that in about three months she was nearly as well as ever. T. K. Monro (Glasgow Med. Jour., Oct., '96).

Case of myxœdema which had been under treatment for five years, remained quite well and free from any myxœdema since he was first treated with the extract. At the present time he takes one or two tabloids twice a week. A. T. Davies (Lancet, Dec. 5, '96).

Case in which, after treatment by extract of thyroid for six weeks, all symptoms had disappeared and the reduction of the weight was forty pounds. This method of treatment does not influence favorably cases of ordinary obesity. All cases must be carefully studied and selected before this powerful agent is to be administered. J. M. Anders (Med. and Surg. Reporter, June 12, '97). (See Myxœdema.)

Lactation.—In the various disorders of lactation the thyroid preparations have been found of signal service, especially as galactagogues.

Literature of '96-'97-'98.

Because of its specific action upon the mammary glands, thyroidin is of

great value to women in whom lactation is imperfect. Hertoghe (Rev. Méd.-Chir. des Maladies des Femmes, June 25, '96).

Thyroid extract is a valuable galactagogue; it stimulates the mammary secretion, while it lessens functional activity of the uterus. Chéron (Revue Médico-Chir. des Mal. des Femmes, Nov. 25, Dec. 25, '96).

Two cases in which deficiency of milk was counteracted by tabloids of thyroid gland. In one of these the milk became free while tablets were being taken, and failed as soon as they were neglected. Stawell (Intercolonial Med. Jour. of Australasia, Apr. 20, '97).

Extract of thyroid gland found to be an efficient galactagogue in certain cases, and the milk secreted under this influence found to be of good nutritive quality. Stawell (Intercolonial Med. Jour. of Aus.; Ther. Gaz., Jan. 15, '98).

Middle-Ear Disorders. — A few myxœdematous patients, suffering from deafness, having improved in hearing during the administration of thyroid extract, several observers gave this drug a trial in chronic adhesive processes of the middle ear uncomplicated with myxœdema. Various results have been obtained, success or non-success evidently depending in a marked way upon the degree of thickening and ankylosis that may be present. On the whole, thyroid is not of much value in aural diseases.

Literature of '96-'97-'98.

Results obtained in a number of patients in Politzer's clinic, commencing with 1 tabloid daily, and increasing them in a fortnight's time to 3 per diem. After four weeks of treatment the drug was discontinued for a week, and again resumed. No bad symptoms observed. At first marked impairment in hearing, both to loud speech and to whisper, while tuning-fork vibrations were better heard through the bone. Sixteen cases remained under treatment and observation from six to eight weeks. Eight remained subjectively and objectively unchanged. Of the remaining eight, two showed evident improvement; four gave a satisfactory result; while in two there was a marked and continued improvement in hearing. Brühl (Monat. f. Ohren., Jan., '97).

Eight cases of sclerosis of the middle ear treated with thyroid tablets, about 5 grains given daily for periods varying from thirty to eighty days. In none of the cases were there any bad results, either in the ears or general system. A permanent improvement in hearing was obtained in three of the eight cases. A. Eitelberg (Archiv f. Ohren., vol. xliii, Part 1, '97).

Trial of thyroidin in fourteen cases of deafness—due in eight cases to adhesive processes, in six to sclerosis. All the cases had previously undergone other treatment without success. Treatment terminated at the end of three weeks where no improvement had occurred. Nine cases showed no improvement. Two had some diminution of tinnitus. In two a marked gain in hearing was experienced. Morpurgo (Rev. Hebd. de Lar., Apr. 23, '98).

Results arrived at by careful treatment, after the manner of Brühl, of 21 cases of middle-ear disease with thyroid. Duration of disease varied from one to twenty years. There were 15 cases of sclerosis, 3 of middle-ear catarrh with ossicular ankylosis, and 3 of ossicular ankylosis following suppurative disease. Nearly all the cases had already been treated in other ways. In no single case did any benefit result from the thyroid, although several cases were benefited by being treated by other methods. Macleod Yearsley (Jour. of Laryng., Rhin., and Otol., Sept., '98).

Muscular and Osseous Dystrophies.—*Muscular Atrophy.*—The fact that two cases of muscular atrophy were greatly improved and reported as such by so reliable an observer as Lépine would indicate that a portion, at least, of these cases can be benefited.

Literature of '96-'97-'98.

Thyroid gland employed in two cases of muscular atrophy and successful results obtained. In one case—a man 44 years of age, who had suffered for eight years—2 ounces daily had been administered for about two months. Improvement had taken place in about two weeks after the beginning of the treatment. The patient felt stronger and had been able to walk alone, which he had not been able to do for some time. Lépine (Revue Inter. de Méd. et de Chir., Aug. 10, '96).

Acromegaly.—The reports of cases of this disease treated with thyroid have been insufficient to warrant a conclusion, but it would seem probable that conditions due to disorders associated with myxœdema or goitre could alone be expected, the osseous hypertrophy being beyond the remedial process.

Literature of '96-'97-'98.

Case of acromegaly treated with dried thyroid extract in gradually increasing doses until 12 grains a day were taken, besides galvanism and tonics. Three months later she was feeling very much better, her memory had improved, and she spoke and moved more rapidly. She had lost over twenty pounds in weight, but felt stronger. General condition practically the same. The history of the case and the marked physical changes leave little doubt that it was a case of acromegaly, but certain anomalous symptoms—such as the puffy conditions of the eyelids, which may, however, have been simply the result of anæmia, though its appearance was somewhat different; the slow speech, and the altered mental state—suggested that her condition was also associated with a loss of function of the thyroid gland. G. G. Sears (Boston Med. and Surg. Jour., July 2, '96).

Case of a woman, 26 years old, who had suffered from acromegaly for upward of two years, and who for a period of five months had been treated with mixed pituitary and thyroid extracts, with great improvement. The superficial resemblance between acromegaly and myxœdema seemed to justify the administration of thyroid extract, especially as, in several cases of acromegaly, treatment with pituitary extract alone had failed to effect any improvement. Rolleston (Brit. Med. Jour., Apr. 17, '97).

Obesity. — The selective action on adipose tissues shown to attend the increased metabolism brought about by thyroid, and the decided increase in the nitrogen excretion sustain the use of this agent in obesity. The effects have been

Case illustrating the association of acromegaly and goitre. (*G. R. Murray.*)

irregular, however, some patients responding readily to the influence of the remedy, but others not doing so. The views of the French authors in this particular, perhaps afford an explanation, namely: young, vigorous, and plethoric individuals, who are good livers, receive little or no benefit from thyroid treatment but are benefited by a dietetic regimen. On the other hand, fat persons that are pale, soft, and flabby, and inclined to œdema, receive benefit from the ingestion of the thyroid gland. They lose weight rapidly, oxidation is in-

creased, and nutrition is improved. We are again brought face to face with conditions showing some of the elements of myxœdema.

Besides the dangers attending the use of thyroid in any case, the only source of untoward effects is the giving of large doses at first, the organs, especially the heart, being thus exposed to the effects of undue reaction. In appropriate cases, the remedy is taken without trouble, and the effects soon show themselves. After a time the reduction in weight is proportionately smaller, and discontinuance of the treatment is followed by recurrence, in the great majority of cases, until the former weight is reached. To maintain the advantage gained, however, dieting and small doses of thyroid at longer intervals may be utilized with advantage.

Case of obesity treated by thyroid juice, 15½ minims daily, either by subcutaneous injection or by the mouth. In three months weight fell from 292 to 253 pounds. As soon as the treatment was discontinued the loss of flesh also ceased, and when the thyroid extract was resumed a daily loss of 1⅔ to 4⅓ ounces was observed, this becoming less after a time. A second case treated showed similar, but less marked, results, while in a third no effect could be noted. The inconstancy of results perhaps depended upon the different forms of obesity, upon the insufficiency of the treatment, or upon the extract used, which may not have been genuine. Charrin (La Sem. Méd., Jan. 2, '95).

The thyroid gland of the sheep a specific in obesity; free from danger and injurious after-effects, and the beneficial results of which appear within a few months from beginning of treatment. The sole risk is in beginning with large doses, as palpitations and fainting fits are possible until the patient is well accustomed to the drug. Frederick Guttmann (Amer. Medico-Surg. Bull., May 15, '95).

Literature of '96-'97-'98.

Three cases of idiots, two of which lost weight rapidly during treatment, while the third gained during treatment and lost weight rapidly afterward. Bourneville (Progrès Médical, Feb. 1, '96).

In excessive obesity with tendency to weakness and anæmia, in which exercise and diet fail, thyroid extract should be tried. H. C. Wood (Univ. Med. Mag., Apr., '96).

Case of a man who took a large quantity of tablets in the hope of reducing his obesity and became maniacal within a few days; œdema of the brain was found at the necropsy. Stabel (Lancet, Mar. 28, '96).

Unpleasant and even serious symptoms observed after the administration of thyroid extracts; attributed to the presence of toxic decomposition products. By the employment of iodothyrin—an active principle of the gland—these unfavorable symptoms can be practically obviated. Used in seventeen cases of simple obesity, it brought about a reduction of weight without the aid of other treatment. In five cases there was diminution in weight after fifteen days' treatment. Lutaud (Coll. and Clin. Rec., Dec., '97).

Tabloids of the whole gland-substance disagree in some instances, owing, no doubt, to the fatty matter they contain. Colloid tablets not prepared according to the method advocated by Dr. Hutchinson decidedly disappointing. Of the three sorts of tabloids used, those prepared according to Dr. Hutchinson's process the most efficacious. P. Jervis (Brit. Med. Jour., Oct. 2, '97).

Of considerable value to reduce weight in obesity, especially in the anæmic, flabby types, and provided the relapse is prevented by diet and exercise. Cabot (Medical News, Sept. 12, '96).

Case of semi-idiocy with tremors, asthenopia, etc., in which, on commencing treatment, the weight was 97 pounds 8 ounces. The thyroids were given, and at the end of treatment the weight was 106 pounds 4 ounces, though there had been fully six months of continuous

treatment by thyroid extract (alcoholic), as much as 72 drops a day, and six months more with thyroid tablets, as much as 10 grains daily. Koplik (Archives of Pediatrics, July, '97).

Three cases of obesity in which was used a new preparation of thyroid gland known as thyroglandin. One grain was given three times daily for a few days. Dose was then rapidly increased until 9 grains were taken in the course of the day. Decrease in weight was rapid and persistent in all cases and was unaccompanied by the unpleasant symptoms so commonly experienced with other preparations used for this purpose. MacLennan (Brit. Med. Jour., July 9, '98).

SYPHILIS.—Thyroid extract has not been extensively tried in this affection, but the few cases reported would seem to indicate that it assists alteratives, mercurials, etc., by stimulating metabolism. In a few cases thyroid extract apparently modified the syphilitic process independently of the usual remedies employed.

Cases of malignant syphilis treated with thyroidin: cachectics, presenting squamous, ulcerous, osseous lesions, which had previously been treated in vain with mercurials and iodides. Thyroidin (dry extract of thyroid glands), 4 to 7¾ grains daily, in tablets, administered, suspending specific medication. Cutaneous and osseous lesions healed in part; even the pigmented spots of the skin were seen to disappear. Menzies (Brit. Med. Jour., July 7, '94).

Case of syphilitic psoriasis. After five weeks' treatment by mercury and arsenic there was considerable improvement, but this line was stopped and the patient placed on thyroid. In three weeks the disease had disappeared, leaving only the usual pigmentation. John Gordon (Brit. Med. Jour., Jan. 27, '94).

Case of severe syphilis cured by ingestion of thyroid gland. Thirty grains progressively increased by same amount until 3½ drachms taken at a dose. Every second day treatment interrupted twenty-four hours. Guladze (Vratsch, No. 30, '95).

TETANY.—The fact that tetany, as well as myxœdema, has not rarely been observed after extirpation of the thyroid gland has suggested the use of this remedy. It has seemed to be of value, especially in the idiopathic tetany of children.

Form following total removal of thyroid gland a manifestation of acute myxœdema, and due to complete arrest of thyroid secretion. Thyroid extract curative. Common tetany may be due to lack of thyroid secretion. Thyroid treatment should be tried. Bramwell, (Brit. Med. Jour., June 1, '95).

Literature of '96-'97-'98.

Case which presented none of the symptoms of myxœdema and possessed an apparently healthy thyroid gland. Tablets, 1 to 3 daily, consisting of 4 grains of thyroidin, used for about a month; the symptoms entirely disappeared. Four months later there had been no recurrence; hence it may be assumed that the cure was perfect. Max Levy-Dorn (Ther. Monat., H. 2, S. 63, '96).

1. In the idiopathic tetany of children the administration of the thyroid gland is extremely useful; it always diminishes the intensity and the frequency of the attacks, and shortens the duration of the disease; it also notably hastens the arrival of the latent period which precedes recovery. 2. The treatment is well tolerated. 3. The organic exchanges, the digestive function, and diuresis are not notably influenced. 4. The circulatory and respiratory functions are accomplished normally. 5. In very young children, on account of their perfect tolerance, it is useful to administer the thyroid gland, raw or slightly cooked, internally. 6. With the exception of certain peculiar cases, it is not necessary to suspend the treatment from time to time. 7. The daily dose is from 30 to 60 grains. 8. This treatment is not opposed to the symptomatic treatment, as it does not present any incompatibility with the methods ordinarily employed. Leone Maestro (Riforma Medica, Nos. 116 and 116, '96).

Torticollis. — Spasmodic torticollis would also seem to enter within the field of thyroid-gland treatment, although a single case can do but little more than suggest its further trial.

Literature of '96-'97-'98.

Case of spasmodic torticollis in which thyroid extract was used. History of four attacks of influenza. On leaving his bed after the third attack, neuralgic pains on the right side of the neck, right shoulder, upper arm and side; slight numbness in the legs. A few days later violent attack of pain, during which his head was drawn down toward the right shoulder. These attacks became frequent, eventually occurring as often as three or four times in an hour. The sterno-mastoid was slightly hypertrophied. Ordered 10-minim doses of thyroid extract to be taken three times in the day: equal to about one average-sized gland. After having taken 2 drachms of the extract, the attacks became less frequent, and were attended with less pain, and after taking about 2 ounces of it he suffered so little inconvenience that he discontinued the treatment. On a subsequent occasion, he was kicked by a horse on the outer right thigh; great tonic muscular spasm; considerable shock. For two days the spasm continued unabated. Thyroid extract renewed; after taking 30 minims the spasm became gradually less, and on taking the drug for two more days, it completely subsided. H. H. P. Cotton (Brit. Med. Jour., July 24, '97).

Uterine Disorders.—Certain conditions influencing the genital apparatus —such as puberty, pregnancy, fibroid tumor, which cause a distinct change in the metabolism of the entire organism— very frequently cause an enlargement of the thyroid gland. Again, the deficiency of the normal thyroid secretion following thyroidectomy in myxœdema, cretinism, etc., is often associated with atrophic changes in the genital apparatus, as shown by Fisher, of Vienna. This sufficiently indicates direct association between the thyroid and the genital system to warrant careful investigation into the uses to which thyroid extract might be put in the treatment of diseases of the reproductive tract.

Literature of '96-'97-'98.

The deficiency of glandular substances in the economy experienced at the menopause seems to suggest that there is some lost principle which we may therapeutically supply until the system has gradually became accustomed to effect the necessary metabolism independently. Quite recently it has been claimed that iodine salts are always present in thyroid extract, which may partly explain the effect. Leith Napier (Brit. Gynæc. Jour., Aug., '96).

So far, thyroid extract has furnished marked evidence of its value for the purpose of arresting hæmorrhage whether this occur in connection with abortion, the menopause, tumors, or uterine malpositions. A remarkable case of metrorrhagia due to hæmophilia successfully treated with thyroid extract is reported by Déjace.

Literature of '96-'97-'98.

Thyroid extract an excellent remedy in threatened abortion with hæmorrhage, and is valuable in preventing the arrest of uterine involution after childbirth. Chéron (Revue Medico-Chir. des Mal. des Femmes, Nov. 25, Dec. 25, '96).

Thyroid extract is particularly favorable in cases of uterine hæmorrhage. In purely functional cases the results had been a complete and lasting cure, also in the hæmorrhages of menopause or dependent on uterine malpositions. The growth of fibrous tumors is also checked by retrogression, and cure has followed its use early in the history of the cases. Jouin (Gynécologie, Oct., '97).

Case of hæmophilia treated by the thyroid substance. Face and mucous

membrane absolutely colorless; the gums bled profusely at the least touch. The legs, arms, and the body were covered with spots of purpura. During each menstrual period the blood was discharged in an alarming abundance, and the menses lasted, on an average, from twelve to fourteen days. She had used all the hæmostatics without avail. Thyroid substance, three capsules a day, was begun on the 9th of October. On the 12th the menses appeared, and instead of continuing for twelve days, as before, lasted but four days and were moderate in quantity. On the 18th the loss of blood from the gums disappeared. Till the 27th the patient had had no hæmorrhage since the last menstrual period. The purpuric spots had disappeared and the gums and face had regained a rosy color. The thyroid substance exercises an action as yet unknown on the plasticity of the blood. M. L. Déjace (Indépendance Méd., Nov. 24, '97).

Case of woman with hæmophilia. For last two years she has been suffering from hæmorrhages from the larynx. She was covered with purpuric spots; her gums bleeding; she was extremely weak and exhausted. Treatment with thyroid tablets commenced; in ten days very marked and evident improvement: there was no purpura, no bleeding from gums. After ten more days she had perfectly normal menses; all other hæmorrhages stopped. Combemale (Médecine Mod., Apr. 30, '98).

Cancer.—Thyroid has recently been tried in this affection, but the cases reported have been too few to warrant any conclusion as to its merits.

Literature of '96-'97-'98.

A case of a woman, aged 61, who had her left breast removed for carcinoma. Three months after the operation recurrence took place in the neighborhood of the cicatrix. Portions of the recurrent growth were submitted to independent investigators, who reported upon them as carcinomatous. Nine months after the operation thyroid extract was given the patient. She improved under it, and the dose, which after a short time reached 15 grains daily, was administered regularly for eighteen months; *i.e.*, until the spring of 1898. She is now quite well, and the nodules of new growths have disappeared. William Bishop and Frederick Page (Lancet, May 28, '98).

Case of patient with recurrent cancer in the axilla after removal of the left breast for cancer, exploratory incision proving the recurrent growth to be so extensive that nothing short of amputation of the extremity would have removed it. There being no other prospects of recovery, both ovaries were removed and the patient put upon from 10 to 15 grains daily of thyroid extract. About seven months later the supraclavicular nodule was no longer to be perceived, while the axillary artery could be felt pulsating and apparently quite free from growth around it. Fourteen months after oöphorectomy the operation-scars (in the axilla) were pale, almost the color of the neighboring skin; soft, not adherent, and without deposit of any kind in the surrounding tissues. Explanation of the success is based on the protozoön theory of cancer, and is to the effect that the withdrawal of ovarian secretion, coupled with the presence of an excess of the thyroid secretion, makes the tissues of some persons a less fit food for the cancer protozoön. G. Ernest Herman (Lancet, June 11, '98).

Thymus Gland.

This organ having been accidentally substituted for thyroid in a case of Owen's and benefit procured, it was found to produce analogous effects in other cases. This led Svehla to undertake a series of experiments to determine its physiological action. Injected into the femoral vein, thymus extract gave rise to a fall of blood-pressure, due to weakening or paralysis of the vasoconstrictors, and increase of pulse-rate, due to direct influence on the heart. When large doses were given there was excitement, followed by dyspnœa and collapse, ending in death, with post-mortem evi-

dences of asphyxia. A certain analogy was thus shown to exist with the physiological action of thyroid, and this was further emphasized by the observations of Baumann, who found that the thymus contained iodine, as does thyroid, although in comparatively small quantities.

Literature of '96-'97-'98.

In the urine of dogs fed with thymus gland has been found a peculiar substance that has the formula approximately of $C_5N_6H_7O_3$ and which is believed possibly to be an imidopseudouric acid,—that is, an oxidation-product of imidohypoxanthin. It is also possible that it is allantoin, and this seems to agree with some of its chemical reactions. It is important as perhaps contributing to the explanation of the form of uric acid derived from nucleinic acid. Minkowski (Centralb. f. innere Med., May 14, '98).

Dose.—The doses of thymus administered have been much larger than would be prudent in the case of thyroid. Of the gland proper the doses have ranged from 2½ drachms to 1 ounce, given three to five times a week; while the extract has been given in doses ranging from 30 to 60 grains.

Therapeutics.—Young sheep's glands should invariably be used; the glands of older sheep, having undergone fatty transformation, are, therefore, worthless.

Goitre. — In this disease thymus seems to produce the same effects as thyroid gland, when administered in sufficiently large doses. In fact, from the results obtained it would appear that the thymus is but a thyroid six times weaker in curative activity.

Three cases in which diet of thymus produced good results,—12 to 15 (5 grains) tabloids given daily. Cunningham (N. Y. Med. Record, June 15, '95).

In the majority of the cases observed, a reduction in the size of the goitre and an amelioration or removal of unpleasant symptoms has taken place. Thymus is to be preferred to thyroid feeding. G. Reinbach (Mittheilungen aus den Grenzgebeiten der Med. u. Chir., B. 1, H. 2).

Ten cases of goitre treated with thymus gland, the ages ranging between 13 and 28 years. From 2½ drachms to ½ ounce of raw sheep-thymus were given on bread three times a week and increased to 7 drachms. In one case of small goitre complete recovery was effected within two weeks. In six cases there was a marked reduction. In two cases there was slight improvement; one was not benefited. Mikulicz (Berliner klin. Woch., Apr. 22, '95).

Literature of '96-'97-'98.

Thirty cases of goitre treated with thymus extract. In twenty decided reduction followed, and the general symptoms were improved. Among these were a number of cases but slightly improved or aggravated by thyroid treatment. A complete cure was obtained in but two cases. Mikulicz (Centralb. f. Chir., p. 929, '96).

Exophthalmic Goitre.—In exophthalmic goitre improvement is reported to have been obtained in about one-half of the cases treated, but there is a striking lack of concordance between the various reports, some authors reporting series of cases in which all cases were materially benefited, others reporting failures on all sides. In a recent paper Hector Mackenzie described a series of experiments having for their object to determine the actual status of the question. He compared results obtained in 15 cases in which thymus was used by other physicians to 20 cases under his own charge. In the 15 cases from other sources there was marked general improvement in no less than 14; in 7 the pulse-rate was markedly diminished; in 3 there was complete and in 4 partial disappearance of exophthalmos. Of the

20 personal cases: 1 died; in 6 there was no improvement; in 13 slight improvement. As to the pulse-rate, in 12 there was no change; in 2 it was increased; in 5 it was slightly and in 1 markedly diminished; but in this 1 the improvement was merely transitory. Of 20 other cases in which remedies other than thymus were employed, in 11 there was no change, in 2 slight increase, in 4 markedly and in 3 slightly diminished pulse-rate; so that, from the side of the heart, there was no special benefit from the thymus. As to the goitre, in 3 cases there was material diminution in size, and in 3 enlargement from thymus. Of the 20 contrast cases: in 13 there was no change, in 4 cases more or less diminution, in 1 complete disappearance, and in 1 enlargement. The balance, therefore, is against the thymus treatment. As to the exophthalmos, diminution occurred in only 1 case, and this commenced before thymus was tried. In the 20 contrast cases, 3 lost the exophthalmos. In the matter of general nutrition there was a slight weight in favor of the cases under treatment by thymus. Williams reported a case in which the symptoms were perceptibly aggravated and Kinnicutt, in two test-cases carefully watched, could observe no improvement.

Case treated by raw sheep's thymus in doses of 2½ drachms to 7 drachms in gradually increasing doses about three times weekly. The subjective symptoms —the exophthalmos and tachycardia— were all diminished, but the goitre and tremor remained unchanged. Mikulicz (Berliner klin. Woch., Apr. 22, '95).

Literature of '96-'97-'98.

Case treated with capsules of dried thyroid, continued nearly two months without any perceptible influence upon her condition or upon the secretions, urea and uric acid being quantitively examined. After trying potassium bromide, nuclein, and an extract of spleen without favorable result, the patient, on July 15th, began to take capsules of dried aqueo-glycerin extract of the thymus gland, 3 a day, each of which contained 1½ grains. On August 5th feeling much better, although there were no obvious changes in the symptoms; on September 7th she was discharged relieved. After having stopped the use of the thymus, in about four weeks after leaving the hospital, she was again provided with capsules to take twice a day. On December 6th the pulse was 92. Improvement; swelling of the thyroid less, and patient able to work. R. T. Edes (Boston Med. and Surg. Jour., Jan. 23, '96).

Case of exophthalmic goitre which, in spite of all treatment, became steadily worse. Thymus-gland medication was begun and continued with the best results. The patient felt so well that, the supply of tabloids being finished, she stopped the treatment, and in a few weeks the exophthalmos was back again to a considerable extent. The tabloids were resumed, and in a short time their benefit was noticeable. N. J. McKie (Brit. Med. Jour., Mar. 14, '96).

Four cases treated by thymus. It certainly does improve the deranged heart-action, but it seems more particularly to lessen the gastro-intestinal symptoms and the tremor and general muscular weakness. Three of the cases had presented great psychical alteration; in all of them the mental state has improved readily. A. Maude (Lancet, July 18, '96).

Case of exophthalmic goitre in a girl of 22. Pulse, 156 and very irregular, both in force and frequency. Thirty grains of dried thymus in the form of tabloids given daily, and on the third day the pulse had fallen to 130 and was quite regular. The amount of thymus was gradually increased to 100 grains daily; at the end of three weeks the pulse had fallen to 73 and was regular. The size of the thyroid was not diminished, but the exophthalmos was less marked. C. Todd (Brit. Med. Jour., July 25, '96).

Three cases of exophthalmic goitre treated with thymus gland. All three were restored to health by the treatment. The dose of the raw gland was from half an ounce to an ounce three or four times a week. In one of the cases discontinuance of the gland was followed by relapse, but on resuming it the patient again improved. Upon one occasion a patient who always had been benefited by the treatment failed to respond to the glands. This was found to be due to their having been taken from full-grown sheep. On giving calf's thymus most urgent symptoms were at once relieved, especially dyspnœa, palpitation, and tremors. David Owen (Lancet, Aug. 22, '96).

Case of twenty years' duration in which ordinary remedies were tried without benefit. Raw thymus obtained from the lamb, in doses of 2 drachms daily for three months, caused the cardinal symptoms to disappear. The treatment was discontinued after seven months. Three months later there was a return of goitre, tachycardia, and slight exophthalmos. He resumed the thymus, taking ½ ounce or more of the raw gland three or four times a week. After three months the exophthalmos and goitre had quite disappeared, the pulse, instead of 120 and over, was 72. The following autumn the patient was unable to take the gland any longer, on account of its nauseating effects. At the end of three months the old disease was returning. He again resorted to the thymus, but took it for two months without any effect whatever. Lambing season corresponding to the spring, however, the failure of the glands doubtless due to the fact that the glands had been taken from older sheep than before. Calf's thymus tried, lamb's not being obtainable. For some time the patient was worse; but, during severe suffering, he took about ½ ounce of calf's thymus, and repeated the dose in the morning. During the following week he improved remarkably. The improvement continued during the winter, but there was a return of symptoms this summer. Now suffers from occasional palpitation, sense of weakness, and low spirits, and some prominence of the eyes. David Owen (Brit. Med. Jour., Oct. 10, '96).

Case of a girl, 21 years of age, who had applied for treatment for palpitation of the heart, prominence of the eyes, and swelling in the neck, first been observed two years ago. All three symptoms were less striking than before the use of thymus gland, begun two months before report. C. E. Nammack (Med. Record, Apr. 17, '97).

Improvement in six out of twelve cases of exophthalmic goitre. The goitre, exophthalmos, and palpitation were improved, and nervousness, insomnia, and tremor very much relieved. Solomon Solis-Cohen (Amer. Jour. Med. Sciences, p. 132, '97).

The best results in the treatment of exophthalmic goitre can be obtained from the joint administration of thymus and suprarenal substances. Solomon Solis-Cohen (Phila. Polyclinic, Sept. 7, '98).

From the cases narrated, there is reason to believe that further use of thymus or its preparations will demonstrate that it is superior to thyroid in exophthalmic goitre, although it may not prove more efficacious than the remedies usually employed in the treatment of this disease.

Suprarenal Extract.

To try to establish the therapeutic application of suprarenal gland or its preparations upon a solid foundation for the present would be a futile effort, physiologists having not, as yet, fully determined any of the purposes of the organs themselves in the human economy. To use the words of Horatio C. Wood, "The functions of the suprarenal capsules still remains a mystery. This only is certain: that disease of these capsules is followed by a progressive asthenia, a peculiar bronzing of the skin, and loss of digestive power with excessive vomiting," while Stockman, referring to its secretion, wonders whether its absence leads to a toxic con-

dition of the blood which poisons the other tissues, or whether the want of it leads directly to an atonic state of the whole muscular system. These, he thinks, are questions which, for the present, must be left open, along with many other important points, such as the origin of the pigment, etc., which are still very obscure.

Physiological Action.—There is good ground for the belief, however, especially since the experimental investigations of Brown-Séquard, Abelous, Langlois, and Dubois, that the physiological function of the suprarenal capsules is to transform or to destroy the toxic substances which are produced in the organism under the influence of muscular activity and of the nervous system. The destruction of these organs is thought to be capable of causing in the organism an accumulation of toxic agents which is the principal cause of the sensation of extreme fatigue and of the profound and generalized asthenia experienced by patients who suffer from Addison's disease.

The evidence that the suprarenal capsules contain a toxic substance of great virulence, much more active than that of any other gland, seems quite conclusive.

> Extracts made from the suprarenal glands of the calf, sheep, guinea-pig, cat, dog, and man have a similar action. Diseased glands from cases of Addison's disease were found by them to be inert. The active principle, whatever it is, must therefore be recognized as an exceedingly powerful body, if we reflect that of this ¼ grain about 80 per cent. is water, and another very large proportion must consist of the proteids, etc., of the gland-substance. Oliver and Schäfer (Jour. Physiol., vol. xviii, pp. 230-276).

The experiments of Dubois would tend to show that the toxic substance isolated is identical to muscle-toxin,—*e.g.*, originating in the muscles. Being foreign to the capsules themselves, these organs would have the destruction of the toxic products as their physiological function. Several albumoses found in the capsules which in themselves seem to possess no well-marked toxic properties would, according to Dubois, possess the properties presented by the organ when used as a remedy.

> Suprarenal extract is much more toxic than the extracts of other glands. Intravenous injections of 30 centigrammes to 1 gramme of a 25-per-cent. solution in glycerin and water killed a rabbit of 1500 grammes in a few moments, while 6 to 12 grammes of other extracts did not produce death. The injection was followed at once by paraplegia, later by convulsions and opisthotonos. If only injected under the skin the animals survived several days, while after death nothing but parenchymatous nephritis could be found. Immediately after each injection a very marked increase in the blood-pressure was observed. Gluzinsky (Wiener klin. Woch., '95).
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> Toxic substance separated from the gland, soluble in alcohol, which caused death in rabbits from respiratory failure. It had no paralytic action, but seemed to act on the central nervous system. Gourfein (Bull. de l'Acad. de Méd., p. 331, '95).
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> If suprarenal bodies of the calf, sheep, or dog were injected, even in very small quantities, into a vein in a dog or a rabbit the following pronounced physiological effects were produced: 1. Extreme contraction of the arteries, which was shown to be of peripheral origin. 2. A remarkable and rapid rise of the arterial blood-pressure, which took place in spite of powerful cardiac inhibition, and became further augmented when the vagi were cut. 3. Central vagus stimulation so pronounced that the auricles came to a complete stand-still for a time, although the ventricles continued to contract, but with a slow, independent rhythm. 4. Great acceleration and aug

mentation of the contraction of the auricles and ventricles after section of the vagi,—the auricular augmentation being especially marked. 5. Respiration only slightly affected, becoming shallower. G. Oliver and E. A. Schäfer (Jour. of Physiology, Apr., '95).

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The active principles of adrenal divided into two classes: (1) several albumoses which are precipitated with alcohol and redissolved in water and which when isolated have no well-marked toxic effect, but which alone possess the property of destroying toxins, especially those originating in muscular tissues; (2) a class composed of bodies which resemble in their constitution and reactions the alkaloids, having a marked degree of toxic effect resembling muscle-toxins. Dubois (Arch. de Phys. Norm. et. Path., vol. viii, p. 412, '96).

The active substance contained in the medullary portion of the capsule and the activity of the extract shown to run parallel with the distinctness of certain color-reactions (*e.g.*, a green with ferric chloride), which are due to a substance which has not yet been isolated in a pure state. Fränkel (Wiener med. Bl., '96).

Experiments showing that after section of the medulla and extirpation of the spinal cord, the injection of suprarenal extract is capable of prolonging life of the animal, which would otherwise quickly succumb. Strickler, in 1877, proved that extirpation of both the cervical and thoracic parts of the spinal cord caused instantaneous stoppage of the heart's action. Biedl (Lancet, Mar. 21, '96).

The active principle is readily extracted by water, glycerin, and weak alcohol, and is apparently a compound of pyrocatechin, a body obtained from it by chemical decomposition. Mühlmann (Deutsche med. Woch., No. 26, '96).

Researches into the constitution of the blood-pressure-raising constituent of the suprarenal capsule showing that it is to be classed with the pyridine bases or alkaloids, and that it is not possible to split off pyrocatechin from the isolated active principle. This view is the opposite of that of Mühlmann, who supposed that the blood-pressure-raising constituent was pyrocatechin joined to some other substance, probably an acid. Abel and Crawford (Johns Hopkins Hosp. Bull., vol. viii, p. 151, '97).

This remarkable power of raising the blood-pressure sustains the value of suprarenal extract in cases of anæmia and neurasthenia in which there is a loss of vasomotor tone. Kinnicutt (Amer. Jour. Med. Sciences, July, '97).

The marked stimulation of the heart and arterioles is probably due to an action on their intrinsic nervous ganglia rather than to a direct action on the muscular fibres. As previously observed by Cybulski, administration of the extract by the mouth or subcutaneously has very little effect on the circulation as compared to what is observed after intravenous injection. Obviously, the active principle is destroyed by the tissues. Gottlieb (Arch. f. Exper. Path. u. Pharm., B. 38, '96).

The extraordinary rise in the blood-pressure after intravenous injection of suprarenal extract is due to stimulation of the vasoconstrictor nerves: the centres in the brain as well as the ganglia in the blood-vessels. The suprarenal extract paralyzes the vagus nerve and the cardiac depressor. It, on the other hand, stimulates the central as well as peripheral ends of the accelerators. The temporary retardation of the heart-beat is produced by the momentary stimulation of the pituitary body, which is brought about by the sudden rise of the blood-pressure in the skull. Cyon (Pfueger's Arch. of Phys., vol. lxii, p. 370, '98).

The medulla of suprarenal capsules contains a chromogen, possibly allied to tannin in coffee, and an active principle which chemically appears to be closely connected with piperidine. This latter has a remarkable effect upon the muscular tissues, generally increasing their tone, and producing, when injected intravenously, an enormous rise in blood-pressure. Swale Vincent (Birmingham Med. Rev., vol. xliii, No. 236).

The active principle of the suprarenal capsule isolated in the form of a powder

of a light-gray to brownish color whose percentage-composition is expressed by the formula $C_{17}H_{15}NO_4$. A primary amine and a methylindol are easily split off from its molecule by treatment with powdered alkalies. Should molecular weight determinations prove that the above formula correctly expresses the molecular weight of the new base, it will be seen that its molecular can obtain only one substituted benzene ring in addition to the nitrogenous complex of atoms from which the skatol is derived. Oxidation and substitution experiments are, however, still necessary before more definite statements can be made as to the constitution of this compound. In its native state, as found in the suprarenal capsule, this substance differs by one chemical reaction only from its state as described in this paper. Chemically considered, the difference in composition between its native state and as here described must be very slight. And yet this difference, which is just marked enough to give a greater stability to the substance, is also great enough, apparently, to deprive it of its power to raise the blood-pressure, for, in the physiological experiments thus far made, small quantities of the new base were found to be inactive in this respect. J. J. Abel (Johns Hopkins Hosp. Bull., Sept., Oct., '98).

The two drugs which most promote contraction of the arteries, and in consequence must antagonize the dangerous fall of blood-pressure produced by chloroform, are atropine and extract of suprarenal capsule. Extract of suprarenal capsule remarkably increases the rate and the force of the heart-beat. Schäfer (Lancet, Feb. 5, '98).

Experiments of Biedl and of Gottlieb repeated. Conclusion that the use of suprarenal gland in the lower animals does much toward preventing accidents during the administration of chloroform, probably through its powerful influence on the vascular system. Minkowsky (Revue de Thér. Méd.-chir.; Ther. Gaz., Dec. 15, '98).

The most useful application of the suprarenal extract will be in cases of cardiac weakness and threatening collapse. Mankovsky (Russian Arch. of Path. Clin. Med. and Bact., Mar., '98).

Oliver treats his cases with pills containing 1 grain of dried extract, corresponding to 15 grains of the fresh gland, or with an alcoholic solution of which 1 minim represents 1 grain of the gland, and has obtained gain in weight, lessened pigmentation, and disappearance of nausea and anorexia.

Aqueous and glycerin extracts are also to be obtained, the dose of which is the same as that of the gland itself, namely: 20 to 45 grains.

Therapeutics.—The disorders in which suprarenal capsule has been found of value are Addison's disease and inflammatory disorders of the eye. It also seems to be worthy of further use in neuræsthenia and exophthalmic goitre.

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Suprarenal extract administered in two cases of exophthalmic goitre of mild type. The tremor and cardiovascular phenomena were improved; in a marked case a similar result obtained; a fourth case was made worse. Suprarenal extract seemed to have a greater influence upon the circulation and less effect upon the goitre and exophthalmos than thymus glands. S. Solis-Cohen (Jour. Amer. Med. Assoc., vol. xxix, p. 65, '97).

Administration.—The use of adrenal and its preparations should be attended with considerable care. It is a powerful agent, and as such is endowed with marked toxic properties. Indeed, several cases of death have been attributed to injections.

The capsules should be obtained from young calves or sheep, and their removal be intrusted to a veterinary surgeon.

Literature of '96-'97-'98.

A special reason for failure of suprarenal capsules is that the apothecary has a faint notion that the suprarenal cap-

sules consist of fat, and a mass of adipose tissue obtained from the abdominal cavity of an animal is supplied to the physician. A first-class veterinary surgeon should alone get the capsule from the animal. H. C. Wood (Univ. Med. Mag., Apr., '96).

As is the case with thyroid gland, the active principle or principles of suprarenal capsules are not affected by digestion. The gland itself, therefore, may be administered in daily doses of 20 to 45 grains.

The active constituent is neither a proteid nor a carbohydrate, it is not affected by acids nor by boiling for some minutes, but is destroyed by alkali, reducing agents, and prolonged boiling. It is not altered by artificial peptic digestion, and therefore, as shown by Oliver and Schäfer, the gland may be given by the stomach. Moore (Proc. Physiol. Soc., '95).

Addison's Disease.—Imperfect action of the suprarenal capsules implying, in the light of our present knowledge, a gradual toxæmia by the products of metabolism, it was thought that the ingestion of the organ or its extracts would prove curative. So far, no cases of final cure can be said to have been witnessed, but several cases have remained well under the continued use of the remedy for a considerable time; some of these, however, have had sudden recurrences, terminating fatally. It is quite evident that the entire question is still very obscure, but it is also certain that the use of adrenal or its preparation merits further trial, especially in the earlier stages of the disease and when the presence of a tubercular process cannot be absolutely recognized.

Suprarenal capsules might be of advantage in the earlier stages, when only the suprarenals are implicated; but later when the neighboring nerves are involved,—the solar plexus and the splanchnics,—extracts of the adrenals cannot overtake the results of nervous changes, which to a large extent lead to the death of the patient. McCall Anderson (Glasgow Med. Jour., Feb., '95).

Case in which suprarenal tabloids and extract were given; after four months' treatment the excessive pigmentation disappeared and she appeared practically well. Lloyd Jones (Brit. Med. Jour., vol. ii, '95).

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Case of Addison's disease treated for eight months with suprarenal extract with most encouraging results. A glycerin extract was used, one drachm of which equaled one capsule. Half a drachm given three times daily at first; increased until in three weeks the daily dose corresponded to three glands. Incipient pulmonary phthisis was also present. In eight months the patient was active, in good spirits, and he increased nineteen pounds in weight. His pulmonary condition had improved. The pigmentation remained about unchanged. Osler (Inter. Med. Mag., Feb., '96).

Case of Addison's disease in which the patient had lost seventy-five pounds in weight, was entirely unable to retain food, and was so weak that she could not sit up in bed without fainting. Under the administration of the glycerin extract of the suprarenal capsule the patient began to improve at once, and a few months later she was apparently well; the skin, however, still remaining bronzed. H. C. Wood (Univ. Med. Mag., Apr., '96).

In two cases of Addison's disease the injection of 45 minims of the aqueous extract every three days produced an amelioration of the asthenia, but it is difficult to say how much had been due to treatment and how much to rest enforced. In the first case an abundant diuresis was noticed. The investigations of Oliver, Schäfer, Cybulsky, and Nebich having shown the tonic action of the extracts upon the circulatory system, it is probable that capsular extracts exercise a more intense diuretic action than other organic extracts. This diuresis, by causing a thorough lavage of the

organism, may contribute also to attenuate the intoxication of Addison's disease. M. P. Langlois (Presse Méd., Sept. 19, '96).

Two cases of Addison's disease treated with suprarenal bodies. In one of these no improvement whatever occurred, and post-mortem tubercular changes in the lungs and suprarenal capsules were found. In the other, where the bronzing and general asthenia followed an injury to the back, marked improvement in the color of the skin and in the general condition took place in two months, when 3 and then 6 raw sheep's capsules were given daily. The improvement has now been maintained for twenty months, under the constant administration of an extract. When it is omitted the patient relapses, but he is now able to follow his ordinary occupation. Stockman (Edinburgh Med. Jour., Feb., '97).

Case in which, after death, the suprarenal bodies were found to be replaced by masses of fat. The patient was treated twice weekly by the hypodermic injection of a dose of extract, equal to a quarter of a rabbit's suprarenal capsule, and later a smaller dose was given every second day by the mouth. Marked improvement followed. Byrom Bramwell (Brit. Med. Jour., vol. i, '97).

Statistics of forty-eight cases of Addison's disease treated with various preparations of the suprarenal gland. Six were cured, twenty-two were improved, eighteen remained unimproved, and in two an aggravation of the symptoms occurred. Among the six cured, one patient remained well for four months; another was well eighteen months after the beginning of the treatment, and a third remained well twelve months afterward. Of the cases in which improvement was reported death occurred in two and relapse in a third (in this case the treatment was irregular). In a fourth the treatment was suspended on account of failure of appetite, and death ensued. A fifth was improved for three months, when sudden death occurred on giving up the treatment. In a woman with all the classical symptoms, remarkable improvement resulted from two months' treatment: the pigmentation disappeared, and she returned to her work as laundress. A daily dose equivalent to 45 grains of the fresh gland recommended. F. P. Kinnicutt (Amer. Jour. Med. Sciences, July, '97).

It may be noted that as yet no case has been reported in which complete and permanent recovery has taken place, although the subjective and objective symptoms are often very materially improved. Cases of fibrocaseous degeneration seem to derive no benefit, while those in which atrophy of the glands may reasonably be diagnosed give much better results. Stockman (Edinburgh Med. Jour., Feb., '97).

Extract of suprarenal capsules causes anæmia of the conjunctiva; 20 to 30 minutes after the instillation of a 10-per-cent. solution into the *cul-de-sac* the palpebral opening becomes smaller and the conjunctiva paler. The sensibility of the cornea remains and the pupil dilates without losing its reflex activity. In inflammatory affections of the eye the anæmia was limited to the conjunctival vessels. It does not affect the retina and does not penetrate to the anterior chamber. Koenigstein (Ann. d'Oc., July, '97).

Case of Addison's disease treated with suprarenal extract. Injections of the liquid extract were given with gradually increasing doses. The pigmentation diminished in a remarkable manner. The unfavorable condition of the stomach and bowels, however, made it impossible to continue the treatment. The case ended fatally. Destot (Lyon Méd., No. 48, '98).

Case of young man, 28 years old, whose sputum contained tubercle bacilli, without any discoverable lesions in the lungs, and who three years previously presented all the symptoms of Addison's disease. At that time under treatment with suprarenal capsules all the symptoms of the disease, including the bronze color of the skin, disappeared in a comparatively short time, and it is now the third year since the patient has been well. Treatment consisted in internal administration of the fresh suprarenal of calves and in the subcutaneous injection of a

watery glycerin extract thereof. Treatment lasted about three months. Béclère (Le Bull. Méd., Feb. 27, '98).

Ophthalmology. — In inflammatory diseases of the eye, the active principles of suprarenal have the power of suddenly stimulating the vasomotors, thus depleting the engorged vessels. In a method recommended by Barraud, sheep-capsules are used, and with the product of evaporation a solution is prepared with equal quantities of sterilized water; this is done, as much as possible, at the time of using, for the solution becomes rapidly altered. One drop of Barraud's suprarenal solution instilled into the eye produces an energetic vasoconstriction of the conjunctiva at the end of thirty to forty seconds. In a few minutes this action is sufficiently marked to cause pallor of the mucous membranes and continues about twenty minutes, after which the vessels return to their former condition.

In an inflamed conjunctiva, the pain and redness completely disappear for the time being. Its application causes no pain even when the congestion of the eye renders it hyperæsthetic.

In ophthalmology, therefore, the aqueous extract of suprarenal capsules finds its application as follows: 1. In conjunctivitis, kerato-conjunctivitis, vascular keratitis, episcleritis, and glaucoma as an aid to the usual medication. 2. In cases in which extreme inflammation of the tissues and intense congestion of the media of the eye limit the action of cocaine, it regains its analgesic power, owing to the ischæmia previously produced by the suprarenal extract. 3. Finally, whenever there is reason to fear a hæmorrhage during surgical intervention on the eye, the extract acts either as a preventive or as a radical hæmostatic agent. (Maurange.)

Dor was first to recommend the application of suprarenal extract in cases where, an operation being urgent, it was difficult to obtain local anæsthesia with cocaine alone, owing to hyperæmia of the conjunctiva. (Darier.)

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The application of a single drop of the solution sufficed to render the bulbar conjunctiva pale even in cases of keratitis, of conjunctivitis, and of iritis. The alternate use of the extract and of cocaine was found advantageous in three iridectomies. In the course of an operation for the removal of a sclero-corneal epithelioma, the extract was useful in rendering the conjunctiva anæmic. Darier (Ann. d'Ocul., Sept., '96).

In two cases of interstitial keratitis where there was considerable vascularity on the surface of the cornea, daily use of a 4-per-cent. solution of suprarenal capsules in three weeks so cleared cornea of all vascularity that vision is now three-fourths normal. Its most brilliant results have been its use in operations in the nose. W. F. Southard (Pacific Med. Jour., Nov., '98).

Aqueous extract of suprarenal gland in all cases of catarrhal conjunctivitis and blepharo-conjunctivitis produced remarkable vasoconstrictor effects. It is of great use in staying hæmorrhage after the removal of tarsal tumor or conjunctival operations. If tissues are rendered anæmic by suprarenal extract, cocaine at once produces its anæsthetic effects. C. Fromaget (Ann. de la Policlin., Mar., '98).

Nasal Diseases.—Suprarenal extract has also been employed in the treatment of nasal disorders with success. (See Nasal Cavities.)

Neurasthenia. — The numerous theories that have been advanced have not contributed in any degree to the cure of this disease, and it is not irrational to search for the proper medication among the organs which may be considered, with good reason, as physi-

ologically able to counteract fatigue and asthenia. Huchard, who emphasizes this view, recommends adrenal extracts in this disease "so rich in pathogenic theories and so poor in curative treatment."

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Two cases in which suprarenal capsule appeared to produce a real amelioration. The preferable method of administration is by the ingestion of the fresh gland, as its active principle is not altered by the gastric juice. The daily amount to be given is from 15 to 30 grains. Huchard (Jour. des Prat., Apr. 18, '96).

Pituitary Extract.

Lesions of the pituitary body having been found in almost all autopsies in cases of acromegaly, a close connection between this organ and the symptoms of the disease could but be inferred; it also suggested the use of the gland as a remedial agent soon after the animal extracts entered the field of therapeutics.

Physiological Action. — Although Mairet and Bosc found that triturated or macerated gland was practically inert in man as well as animals, producing rise of temperature and emaciation, Schäfer and Oliver found, to the contrary, that it was quite active, affecting mainly the arterioles and heart-muscle. It is thought to bear some undetermined relation to the nutrition of bone or dermal tissues.

Rapid and great rise of blood-pressure observed, bearing directly upon the arterioles and probably upon the heart-muscles. The pituitary body furnishes a secretion to the blood which serves to increase the contractile power of the heart and arteries and to influence the nutrition of certain tissues. Schäfer and Oliver (Jour. of Phys., p. 277, '95).

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In animals (rabbits), excepting disturbances evidently due to local infection produced by the subcutaneous injections, very slight effects were obtained: a transient elevation of temperature, most marked two hours after the injection. Injected into the veins it produced disturbances similar to those obtained after injection of blood, namely: death from coagulation. If treated by sodium chloride or by heat it produces results similar to those of blood-serum when similarly treated, but it is distinguished only by a more marked myosis; and given by the mouth, macerated or triturated pituitary gland causes, besides a slight elevation of temperature, a noticeable gastro-intestinal disturbance and a temporary albuminuria, showing that this substance possesses only a slight degree of toxicity. With dogs nothing of importance is noticed: slight emaciation and slight elevation of temperature. With healthy men the same results were reached. Mairet and Bosc (Arch. de Phys., No. 3, p. 600, '96).

It is probable that the pituitary gland bears some unascertained relation to the nutrition of bony and dermal tissues, as a result of which an overgrowth of them accompanies changes in the gland which presumably affect its functions. Whether or not these changes are primary is yet unknown. F. P. Kinnicutt (Amer. Jour. Med. Sciences, July, '97).

Therapeutics.—In acromegaly it cannot be said to have done much more than to relieve some of the active symptoms and to have contributed to the patient's comfort. This means considerable in these cases, which sometimes suffer greatly from neuralgic pains, violent headaches, etc.

Three cases in which pituitary substance was given. The headache, which was extremely violent, diminished considerably in intensity, but the remedy had no effect on the neuralgic pains in the limbs. The general condition was improved, but no diminution in the size of the affected extremities detected. The most definite objective effect of the treatment was increased diuresis. Marinesco (Semaine Méd., Nov. 13, '95).

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Case markedly benefited by treatment with animal extracts. During the first two months she took ½ grain of thyroid extract three times a day. One grain of this extract represents 10 grains of the fresh gland. During the third and fourth month desiccated pituitary bodies were given, about 1½ grains three times a day. During the last month a combination of both extracts was administered: 4 grains of desiccated pituitary bodies and ½ grain of thyroid extract a day. H. H. Dinke (Med. Record, Nov. 28, '96).

Case of a woman, aged 26, who had suffered from acromegaly for upward of two years. Since November, 1896, she had been treated by mixed pituitary and thyroid extracts, under which she had greatly improved. This improvement had been maintained since she had left the hospital; so that it could not be attributed to rest in bed. Rolleston (Brit. Med. Jour., Apr. 17, '97).

Statistics of 13 cases of acromegaly treated with pituitary preparations: In 7 cases varying degrees of improvement were noted. In 1 of these the improvement occurred under the combined use of pituitary and thyroid preparations. In 5 cases no effect was obtained; and in 1 case the patient was made worse by the treatment. F. P. Kinnicutt (Amer. Jour. Med. Sciences, July, '97).

Organic Extracts.

Preparations of the various organs, the spleen, the ovaries, bone-marrow, the testicles, the brain and nerves, the kidneys, the lungs, the liver, and the pancreas have all been tried as remedial agents; but it may be said that, while only the products of the first five have attracted wide-spread attention, those of the spleen and ovaries alone seem to present sufficient value over other means at our disposal to still merit the confidence of the profession.

The preparations of the first five organs mentioned in the list will be reviewed in this article. The literature of the others is so scanty that no adequate idea could be conveyed of their actual worth.

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Strength of organic extracts may be tested by adding to them Biondi's staining-fluid. If nuclein is present in large amount and the extracts therefore are of good quality, they will turn a distinct green. Posner (Berliner klin. Woch., Mar. 14, '98).

Splenic Extract.

The use of spleen was suggested mainly by the fact that enlargement of that organ occurs in some cases of cretinism and myxœdema and after removal of the thyroid gland. This was further substantiated by the experiments of Oliver and Schäfer, who obtained a fall of arterial pressure followed by a gradual, but steady, rise, by means of intravenous injections of splenic extract, thus demonstrating that it was not inert. Krüger found that it increased the excretion of uric acid and of the xanthin bases.

Literature of '96-'97-'98.

Effect of spleen substance administered to a number of patients in the Lanark County Asylum, Hartwood, investigated for a period of two years. It was found to aid digestion and nutrition, to increase the cutaneous circulation, to stimulate the glandular activity of the skin, and in some cases to produce a favorable change in the mental condition. A. C. Clark (Edinburgh Med. Jour., Feb., '98).

Results of investigation of therapeutic value of spleen extract. Treatment was begun with three capsules of desiccated spleen representing 100 grains each of fresh spleen; this was increased to 6 capsules a week later. Capsules of liquid extract, each containing 20 grains of fresh spleen, were tried some weeks later, and with more distinct benefit. Conclusions are:—

1. That the most general result of this treatment is physical improvement.

2. That its action on the mental state is undoubtedly evident in a fair proportion of cases, especially of adolescents, sometimes direct, at other times owing to improved physical conditions.

3. That it materially assists in rendering thyroid treatment efficacious, the patient, after a course of spleen treatment, being more susceptible to the action of thyroid.

4. That where it fails there may be a defect in the preparation of the extract. We have found that capsules of the liquid extract are best. They have been made for us by Duncan, Flockhart & Co. The desiccated spleen, which is usually employed for tablets, must necessarily lose some of its active properties.

5. It is best given at least half an hour before meals. Charles A. Bois and Neil T. Kerr (Brit. Med. Jour., Sept. 10, '98).

Administration.—Two practical difficulties are met with in administering splenic extract: it produces gastric pain and derangement of the digestion when given by mouth, and great local irritation and even abscesses when administered hypodermically, although, of course, this does not always follow. A splenic extract employed by Cohnstein is known by the trade name of "erythrol." It is a watery extract to which salt has been added, partly to preserve it and partly to give it a better flavor. It is described as resembling Liebig's beef-extract. The amount to be given daily is from 1 to 2 teaspoonfuls, dissolved in hot water. It does not seem to occasion distress.

Exophthalmic Goitre.—H. C. Wood observed three cases in which spleen extract produced very satisfactory results. One was cured and the other two were greatly improved. The advisability of trying this remedy is thus greatly emphasized.

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Case of severe chronic exophthalmic goitre treated some years ago, in which an acute splenitis developed in a manner which was altogether inexplicable; no cause for the attack could be made out. Deep in the parenchyma of the organ there was formed an abscess whose opening and discharge were, after many months of severe sepsis and desperate illness, followed by return to health. In the second or third week of the splenitis the enlarged thyroid began to diminish, and in a short time regained the normal size. The result was a permanent cure of the exophthalmic goitre, no symptoms of the disease returning.

In a private case, the disease was of six years' duration; the exophthalmos was very pronounced; the action of the heart extremely rapid and irregular,—about 180. The enlargement of the thyroid was very great. The breathlessness was marked, and the general nervous erethism such that the patient was on the verge of insanity. A teaspoonful of the glycerin extract of spleen produced at once violent gastric distress, with local pain, lasting for some hours, and complete disgust for food. Other doses gave similar results. Following this, 10 minims were injected twice a day hypodermically into different portions of the body; they produced much local pain and hardening of tissue, but no abscess. This was kept up for six months, when 10 drops of the spleen extract with 10 drops of digitalis were administered three times a day. The improvement began not a great while after the commencement, and gradually increased. Before the treatment there was extreme breathlessness; now she walks comfortably for a long distance. H. C. Wood (Amer. Jour. Med. Sciences, May, '97).

Blood Disorders.—The physiological functions of the spleen promptly suggested the use of spleen extract in diseases of the blood, and encouraging results were obtained by Danilewski and Cohnstein. The former had found that the use of a watery extract of the ox's spleen, whether given by the mouth or subcutaneously, gave rise to a notable increase in the number of the red blood-corpuscles in dogs and rabbits.

Case of leukæmia treated by injections of splenic extract. There was very little pain, but copious sweating and fear, with which dyspnœa was sometimes associated. The effect on the blood was a decided increase of the number of leucocytes immediately after the injection, followed later by an increase, not sufficient, however, to restore the number to that previously present. This result is not interpreted as an evidence of real improvement in the disease, but rather as an apparent change due to retention of the leucocytes in the capillaries of the lungs. Paul Jacob (Dent. med. Woch., Aug. 9, '94).

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Statistics of twenty-three cases in which a watery extract (eurythrol) was employed. In one case the disease was leukæmia; the others were examples of anæmia or chlorosis. In the case of leukæmia there was only a transitory effect observed, not really therapeutical. On the other hand, in the majority of the cases of anæmia and chlorosis the action of the extract was very striking. The first signs of improvement were seen in the subjective symptoms of debility, loss of appetite, constipation, headache, and dysmenorrhœa. Objectively, the pallor disappeared, and often there was an increase of the hæmoglobin or of the number of the red blood-corpuscles. In many cases the patients gained flesh notably. In many others there were no objective signs of improvement. In no instance was any unpleasant effect observed. W. Cohnstein (Allgem. med. Central-Zeit., No. 43, '96).

Ovarian Extract.

Four well-known facts are given by Muret as fundamental reasons for the use of ovarian extract as a remedy,—namely, that (1) without ovaries there is no uterine development or menstruation; (2) ablation of ovaries in young children cause them to grow up without any feminine attributes; (3) after puberty loss of ovaries entails cessation of menstruation and atrophy of genital organs; (4) osteomalacia is cured by oöphorectomy,—all generally explained by some indefinite action of the nervous system. But the active principle giving rise to these effects is not defined.

Preparations and Dose.—The therapeutic uses of ovarian substance were studied by Touvenaint. Heifers' ovaries can be reduced to powder by desiccation at a temperature of 25° C. Pills containing $1\frac{3}{4}$ grains of the dry powder can be used, corresponding to 12 grains of fresh ovary. Three of these may be taken daily a quarter of an hour before meals. The average dose of dried ovary powder should not exceed 4 to 5 grains daily.

Liquid ovarian extract is another form: a glycerin extract of ovaries of young cows, containing 15 grains of ovarian tissue in $7\frac{1}{2}$ minims of glycerin, which is injected into the buttocks daily in doses of 7 to 15 minims.

Compressed tabloids, containing 4 to 5 grains of dried gland, proved quite as efficacious as the injections, when two or three a day were given, and were finally used in place of the injections. The treatment can be continued for a month or more and is always well borne. (Muret.)

Therapeutics. — In disturbances following removal of the ovaries or uterus, or in the nervous phenomena attending the menopause, ovarian tissue has given considerable relief. Lissac first tried crude ovarian tissue and ovarin by the mouth, and hypodermic injections of ovarian liquid; but ovarin was found to be most convenient, though it sometimes caused indigestion. The insomnia from which the patients all suffered was promptly relieved; cephalalgia generally disappeared and many psychical symptoms, mental depression especially, were ameliorated. In four of his cases uterine

hæmorrhages ceased under treatment. The treatment should be continuous, however, if the relief is to be maintained. He mentions sixteen cases treated by Jayle in the same manner in which the flushing was more or less relieved, but returned after cessation of the treatment.

In exaggerated symptoms of the natural or induced menopause the ovarian treatment may be applied in two ways: (1) through transplantation of ovarian tissue, and (2) administration by the mouth. In case of induced menopause through hysterectomy no effect was obtained; but, of cases presenting severe symptoms during the natural menopause, three very much improved. Chrobak (Centralb. f. Gyn., No. 20, '95).

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Results obtained from the use of ovary-juice in various diseases of women, especially those peculiar to the menopause. In 51 cases, 34 of which were personal, the results warrant the following conclusions: 1. The troublesome symptoms of the natural menopause disappeared or were greatly diminished by the use of the ovarian extract without any other medication. 2. Similar effects were produced by the administration of that substance in the relief of symptoms—for instance, irritability of the bladder—that follow surgical operations which have for their result the suppression of the menstrual flow. 3. Rapid improvement is constantly seen in chlorosis and dysmenorrhœa. 4. The influence of extract of ovary on the psychical disturbances which accompany or are dependent on genital lesions are undeniable. 5. Rapid and permanent improvement in the general state. 6. Climacteric metrorrhagia without neoplastic lesions yield rapidly to the administration of the remedy. 7. Its therapeutic action on the nervous system is manifest from the first day of its administration. Author states that he will shortly publish the results of laboratory researches as to the chemical constitution of the substance which he prescribes. C. Jacobs (La Policlinique, Dec. 1, '96).

Tablets of 3½ grains (Merck) of the entire ovarian substances, of the precipitate of the follicle-contents, or of cortical substance of the ovary of the cow, used in eleven patients, where either part or all of the internal genital organs had been removed; or where the patient complained of symptoms of the natural menopause,—amenorrhœa, the result of atrophy of the genitalia, etc. The results were, as a rule, very encouraging, the symptoms being very much relieved. Mond (Münchener med. Woch., No. 14, '96).

Ovarian substance used in patients who had reached the climacteric age, who complained principally of sensations of fullness in the head, occurring many times during the day, pains in the back and legs, etc. The dose varied from 15 to 22 grains, administered in tablets containing each 7½ grains of the ovaries of sows or cows. The sensations of fullness in the head had practically disappeared in two weeks. To avoid the influence of suggestion tablets containing none of the substance were given from time to time, but the symptoms immediately reappeared and the patients felt worse. The effect lasted only while the ovarian substance was being taken. Landau and Mainzer (Lancet, July 4, '96).

Ovarian extract tried in 21 cases, 9 nervous disorder due to menopause and of usual vasomotor origin, insomnia, lumbar pain, visceral troubles, flatulence, anorexia, etc. All cured or much improved. Three cases of climacteric irregularity of menstruation: 2 were cured and 1 improved. Muret (Rev. Méd. de la Suisse Rom., July 20, '96).

Ovarian extract appears to be particularly indicated in amenorrhœa and chloranæmia, in which the results are excellent. It is very useful in all cases of artificial menopause due to removal of the genital apparatus. It can also be tried with advantage for the removal of symptoms due to natural menopause. Touvenaint (Méd. Mod., Oct. 17, '96).

Ovarian extracts act directly for the relief of the disturbances attending the menopause, either natural or artificial. Its use is also valuable in amenorrhœa,

dysmenorrhœa, and in anæmia of ovarian origin. Good results have also been noted in some cases of simple oöphoritis. Jayle (Revue de Gynéc. et de Chir., No. 4, '98).

Oöphorin preparations given to women suffering from acne roseacea and cutaneous disorders at the menopause, with satisfactory results. E. Saalfeld (Berliner klin. Woch., No. 13, '98).

The nervous disorders following removal of the ovaries or uterus were also found to be relieved by Landau and Mainzer, but only temporarily.

Knauer has shown that in rabbits the ovaries can be removed and then transplanted in other than their normal position. They can be attached to the peritoneum as well as implanted between muscle-fibres. Thus implanted, the ovary is nourished and continues its function. Might this not be repeated in the human subject to antagonize the symptoms following oöphorectomy or castration for hypertrophied prostate?

Case in which bilateral oöphorectomy was followed by flashes of heat, profuse sweating, headache, and marked sensations of pressure in the occipital region preceding and during the early part of the menstrual period. Three-fourths to 5 drachms of ovarian substance administered twice a day caused the attacks of flashes of heat and sweating to become less frequent and severe. This was followed by general improvement. Stachow (Monat. f. Geburtshulfe u. Gyn., B. 4, H. 1).

In disorders of any kind resulting from uterine affections, it seems to merit further trial.

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Four cases of chlorosis treated for fourteen days with rest in bed alone, then a second period of fourteen days with ovarian extract. A relatively larger increase of hæmoglobin in the second series, and in three of these a larger increase in weight. The menses appeared in two after an absence of some months. Muret (Rev. Méd. de la Suisse Rom., July 20, '96).

Case of epilepsy in a young girl, appearing only at the beginning of menstruation, controlled by giving 8 tablets daily, and recurring when the dose was diminished. The ovarian treatment should be tried in all cases of epilepsy which appear to be connected with functional troubles of the reproductive organs. C. Bodon (Deutsche med. Woch., No. 45, '96).

Bone-marrow.

On the assumption that the red blood-corpuscles were produced mainly from the red bone-marrow, J. Dixon Mann, of Manchester, utilized an extract of this substance in anæmia and other conditions dependent upon a depraved condition of the blood. The cases have been numerous in which the results have apparently supported Dixon Mann's hypothesis, great and rapid proliferation of the red corpuscles having been noted.

Case of pernicious anæmia in which bone-marrow was employed with considerable success. Hæmocytes, 1,860,000 to 1,460,000 per cubic millimetre; hæmoglobin, 28 to 30 per cent. Three ounces of uncooked bone-marrow from the ox given by the mouth daily. After twenty-seven days the hæmocytes numbered 3,900,000 per cubic millimetre and the hæmoglobin amounted to 78 per cent. Fraser (Brit. Med. Jour., No. 1744, '94).

The tissue-forming power of young animals being taken as a criterion, the marrow obtained from them was thought to be preferable to that of older animals. The best results were obtained from the marrow contained in the ribs of a young animal. The coarse marrow from the long bones contains a great deal of fat, which does not contain the specific virtues to the same extent as the finer medullary substance.

Preparation.—The method of preparation advocated by the majority of

writers is that recommended by Danforth, of Chicago. The anterior extremities of calves' ribs are comminuted so as to expose the cancellated tissue, and the fragments are placed in a jar and covered with glycerin, to the influence of which they are exposed for three or four days, being occasionally agitated. At the end of this time the liquid is strained, and the resulting fluid presents a reddish, syrupy appearance, without pronounced odor, and with the taste of glycerin. At first a teaspoonful of this extract is administered thrice daily.

The marrow may also be administered raw, on bread, but this method is usually repulsive to the patient.

Physiological Action. — An indirect influence as to the action of bone-marrow may be obtained from recently-made experiments by Trambusti, which have shown that bone-marrow reacts in the course of an infective diphtheritic process in rabbits with great functional activity of the cellular elements of which it is composed. This energetic functional activity of the cellular elements tends more toward the function of secretion than to that of reproduction. The increased function of secretion shows itself microscopically both by a greater quantity of granulations in the interior of the cell-plasma, and by a greater quantity of free granulations. The great functional activity of the cellular elements is diminished, with the progress of the infection, by the accumulation of a greater quantity of toxic material within the organism. Although this material in small dose stimulates the above-mentioned energy, yet it here acts as a paralyzant and in producing necrosis. The results which he has obtained from the use of bone-marrow justify the belief that the leucocytes produce a substance which is bactericidal and antitoxic. Its effects have been ascribed to the presence of iron.

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Whether or not it is anything more than an assimilable preparation of iron is not conclusively proven. Bone-marrow, especially red marrow, is certainly a readily-assimilated, organic compound of iron, and is a valuable addition to the resources of the physician in cases of ordinary chlorosis and anæmia and in some cases of blood impoverishment of a more intractable kind. W. E. Quine (Boston Med. and Surg. Jour., Aug. 6, '96).

Any action bone-marrow may have must be due to some ingredient which stimulates blood-formation, and not to iron, or to any other constituent which might be directly used to build up red blood-corpuscles. Stengel (Ther. Gaz., '96).

Therapeutics.—Not much can be said in favor of bone-marrow as a therapeutic agent. In pernicious anæmia it in no way approaches arsenic in value; in anæmia indications would seem to show that it is not as reliable as iron. In leucocythæmia, leukæmia, and Hodgkin's disease it seems worthy of more extended trial.

Pernicious Anæmia. — It is very doubtful whether bone-marrow can in any way be compared to arsenic as a remedial agent in pernicious anæmia. The belief that the active agent of marrow is iron would sustain this view, iron being as useless in true pernicious anæmia as it is useful in the benign form. There is ground for the suspicion that an erroneous diagnosis led to some of the favorable reports published. These are not included in this review.

Again, in the majority of the cases of pernicious anæmia treated with bone-marrow hitherto reported, their value as therapeutic records is much diminished by the fact that other drugs were often

given in addition, and also that in no case has the further history and ultimate fate of the patient been recorded. It is well known that such cases often improve for a time under various forms of treatment, but they tend always to relapse, and ultimately to die.

Case of pernicious anæmia in a man, aged 60, treated with iron, arsenic, and salol, who made no progress until 3 ounces of ox-marrow were given in addition. Complete recovery followed. Fraser (Brit. Med. Jour., vol. i, p. 1172, '94).

Bone-marrow given in one case of pernicious anæmia, without benefit; in a second, however, occurring in a man aged 43, who had become worse under arsenic and to whom 3 ounces of fresh marrow were then given daily, the results were remarkable. In two months the blood-condition had returned to the normal in every respect. Barr (Brit. Med. Jour., vol. i, p. 358, '95).

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Case in which marked improvement was brought about by bone-marrow and in which benefit had persisted up to the date of the report. Janeway (Ther. Gaz., May 16, '96).

Three cases of pernicious anæmia in which the red marrow did not have the least effect. In one of the cases rapid improvement was noted as soon as the patient was placed on arsenic. Bone-marrow should not be given unless arsenic has failed. G. B. Hunt (Lancet, Feb., '96).

Two cases of pernicious anæmia treated with bone-marrow. The first, a man aged 39, had various ups and downs, but ultimately succumbed. The second case occurred in a woman aged 60; but under similar treatment she also progressively sank. Stengel (Ther. Gaz., '96).

The most that can be said for bone-marrow in pernicious anæmia is that it should be tried where arsenic fails.

Anæmia and Chlorosis.—In severe anæmia, whether primary or secondary, bone-marrow has given better results than in pernicious anæmia. Here it would find a logical application, especially if, as thought by Quine, it represents an assimilable preparation of iron. The marked increase of hæmoglobin and the general improvement noted, especially in Mann's cases, would seem to warrant further trial of the remedy.

Trial in two cases of anæmia and two of chlorosis; doubtful whether the bone-marrow treatment is superior to iron. J. S. Billings, Jr. (Johns Hopkins Hosp. Bull., vol. v, No. 43).

Bone-marrow will probably be found to be of value in cases of anæmia and leucocythæmia and perhaps in cases of chlorosis also. It is yet too early to decide as to its uses and abuses. Henry Hun (N. Y. Med. Jour., Jan. 12, '95).

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Administration of the medullary glyceride has shown better results than that of iron or arsenic. Danforth (Amer. Med.-Surg. Bull., May 16, '96).

All that can be said at present is that there is sufficient evidence to warrant the administration of the medullary glyceride in cases of severe anæmia. H. C. Wood (Univ. Med. Mag., Apr., '96).

Twenty-two insane male cases of anæmia treated with bone-marrow. The average increase in red corpuscles was 1,361,489. The percentage of hæmoglobin increased on an average of 12.5 per cent. The leucocytes, which in nearly all were abnormal at first, decreased in number at the end of the month. The whole general appearance in the majority of the cases improved. Appetite was better and the action of the bowels more regular. Mentally, one case began to improve at once and soon went home recovered. Three were regarded as much improved and four others were brighter and had lost a great deal of the apathy they formerly had. In the remaining fourteen the only improvement noticed was in their physical condition. Best results obtained with an extract made at the hospital by finely-chopped ribs of sheep

and adding glycerin in the proportion of one pound to twelve ribs. This was permitted to macerate four days. It was then strained through gauze and was ready for use. W. O. Mann (Amer. Jour. of Insanity, Jan., '97).

Ten cases of anæmia and chlorosis treated by a preparation of nucleo-albumin and bone-marrow, shown in the table. D. D. Klots (N. Y. Med. Jour., Oct. 30, '97).

ment of leucocythæmia, but so far there has been no great success, and the reason of the failure is obvious when we remember that in leucocythæmia the bone-marrow is hypertrophied, not atrophied. It is not probable that glycerin extracts of marrow will prove valuable, since there is already too much marrow-activity. (H. C. Wood.)

Case No.	Disease.	Percentage of Hæmoglobin at Beginning of Treatment.	Percentage of Hæmoglobin at End of Four Weeks.	No. Red Blood-cells at Beginning of Treatment.	No. Red Blood-cells at End of Four Weeks.	Weight at Beginning of Treatm't.	Weight at End of Four Weeks.
1	Chlorosis	54½	74	2,730,000	4,210,000	117	124
2	Chlorosis	43	68½	2,140,000	4,020,000	108	115
3	Chlorosis	51	75	2,340,000	4,120,000	93	99
4	Chlorosis	34	61	2,310,000	3,990,000	104	113
5	Chlorosis	44	74	2,360,000	4,030,000	117	123
6	Secondary anæmia	36	71	2,140,000	4,430,000	123	131
7	Secondary anæmia	51	62	2,420,000	3,320,000	133	136½
8	Secondary anæmia	54	65½	2,430,000	3,470,000	111	117
9	Secondary anæmia	42	63	2,170,000	3,940,000	141	149
10	Secondary anæmia	68	79	3,620,000	4,100,000	122	129

Malarial Cachexia.—In malarial cachexia bone-marrow has been tried, but, doubtless, what beneficial influence may have been obtained was due to the improvement in the condition of the blood.

Bone-marrow successful in two cases of malarial cachexia. All modes of treatment had failed. The remedy given in daily doses of 1½ to 3 ounces, either raw or in sandwiches. T. K. Alexeiew (Rev. Gén. de Clin. et de Thér. Jour. des Praticiens, Nov. 16, '95).

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Four cases of malarial cachexia with the spleen and bone-marrow of cattle, with apparently favorable results. Gritzmann (Allg. Wien. med. Zeit., June 30, '96).

Leucocythæmia and Leukæmia.—Extracts of the bone-marrow and of the spleen have been employed in the treat-

Excellent results from the treatment of a case of leukæmia, in a lad of 12, with bone-marrow taken raw and spread on bread. After a few days the method was not particularly disagreeable. The improvement little short of marvelous. Rigger (London Lancet, Sept. 22, '94).

Good effects apparent within a few days. A. McLane Hamilton (N. Y. Med. Jour., Jan. 12, '95).

Case of splenic myelogenous leukæmia in which bone-marrow did not prove curative. Arsenic had also been used, but its physiological effects caused it to be stopped. Beneficial effects of marrow shown, however, by reduction of spleen and blood-count. C. E. Nammack (N. Y. Med. Rec., Dec. 14, '95).

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Case of leucocythæmia in which, during seventeen days' treatment under arsenic (2 to 12 minims, t. i. d., liq. potass. arsenit.), no improvement occurred. A dessertspoonful of ox's bone-

marrow spread on toast being given three times a day with arsenic, a remarkable diminution in the number of leucocytes followed, and continued after the arsenic was stopped. At the end of eight weeks the erythrocytes numbered 4,170,000, the leucocytes 25,000 (1 to 167). The patient left the hospital and subsequently ceased taking the marrow. At the end of six months she returned with the spleen larger than ever; the erythrocytes numbering 3,670,000; leucocytes, 225,000. Again given the tabloids of bone-marrow and began to improve at once. Four weeks later the patient became very ill, breathless, pulse rapid, temperature 102° F., pulmonary congestion and pleurisy, œdema of face and upper and lower extremities. The patient died a week later. At the autopsy there was a typical leucocythæmic spleen. Whait (Brit. Med. Jour., Apr. 4, '96).

Hodgkin's Disease.—Recent observations tend to show that bone-marrow may become a valuable remedy in certain forms of Hodgkin's disease.

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Well-marked case of Hodgkin's disease, erratic temperature, varying from normal to 102.5°. Patient put upon the usual arsenic treatment, beginning with 2 minims thrice daily, and gradually increasing the dose until she was taking 7 minims three times a day of Fowler's solution, but in spite of this she steadily and rapidly got worse, till at the end of five weeks she was a perfect skeleton, profoundly anæmic, sleepless, and the group of glands affected so agglutinated that outlines of single glands were quite obliterated. The spleen was enlarged, temperature was almost constantly about 100° F., and her digestion failed completely. The case seemed rapidly moving toward a fatal termination.

Although bone-marrow tabloids had previously been tried in a case of the same disease in an adult without the smallest benefit, they were used in this case beginning with 1, thrice daily. The vomiting and diarrhœa soon ceased and the temperature was normal. This improvement steadily continued. The number of tabloids taken was gradually increased, till at the end of a fortnight she was taking 6 in the day. After two months she was apparently in good health, although the submaxillary and one of the cervical glands were still large. The tabloids were finally stopped. A fortnight afterward she was once more somewhat anæmic, and with the glands, which had subsided to normal, appreciably enlarged; tabloids resumed; she still continues to take 3 a day, and is now a plump, healthy child, but she still presents slight enlargement of the submaxillary and one cervical gland. J. D. L. Macalister (Brit. Med. Jour., Nov. 13, '97).

Case of Hodgkin's disease at first placed on one fresh sheep's thyroid daily. Tiring of them, the patient was placed upon extract of bone-marrow and thyroid. From this time on there was rapid amelioration in all of the symptoms. The cough and night-sweats ceased and the glands rapidly diminished in size. Six months later she reported herself as feeling quite as well as she did before her illness. The enlargement of the glands had all disappeared. M. B. Herman (Memphis Med. Monthly, Feb., '96).

Osseous Deformities. — Although affording but little information as to the actual value of marrow in disorders of bone, the following cases are nevertheless suggestive:—

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Case of rheumatoid arthritis with symmetrical spindle-shaped joints and ulnar deviation. Under marrow, pain, creaking, and deformity were markedly reduced.

Case of rheumatic ankylosis of right wrist in a woman aged 43, flexion and supination being lost. Improvement.

Case of lateral curvature in a girl aged 17½. The point gained was increased development of both sides of the chest, but much more on the weaker side.

Case of angular curvature in a girl aged 18. The curvature itself not re-

duced in size, but its irregularities have become smoother.

Extreme case of osteomalacia in a woman aged 44. The patient had not walked for twenty years. After bone-marrow treatment she could stand by holding to a chair, and could get from her bed into a chair unaided. T. M. Allison (Med. Press and Circ., Oct. 14, '96).

Orchitic, or Testicular, Extract.

As is well known, the removal of the testicles transforms the physical and mental attributes of an animal. Upon this is based the natural conclusion that these glands bear considerable influence upon general development and nutrition. With this undeniable fact before him, Brown-Séquard conducted investigations having for their object to determine whether the product could not be utilized as a therapeutic agent, and, after a series of experiments upon his own person, he ascertained that testicular fluid was capable of increasing mental and physical vigor. As to the curative influence on the various morbid conditions of the organism, he was of the opinion that, by injection under the skin, it could bring about the cure or considerable improvement of organic or non-organic affections of the most varied character, or, at least, cause their effects to disappear. These actions of the liquid were thought to be brought about in two ways: the nervous system, gaining in force, became capable of ameliorating the dynamic or organic state of the diseased parts, and, by the entrance into the blood of new material, new cells or other anatomical elements were formed, thus contributing to the cure of the morbid condition.

Unfortunately clinical evidence has not sustained the hopes of the distinguished physiologist, and the method introduced by him has, for the present, at least, practically fallen into disuse.

Testicular liquid was thought to possess such antiseptic properties that, if it should be contaminated by pathogenic germs, these germs would be rapidly killed or rendered powerless; but it was shown that the antiseptic properties were merely those possessed by any acid substance over certain micro-organisms.

Testicular fluid always has an acid reaction, so that it is not surprising that it sterilized organisms which could live only in an alkaline medium. If microbes which could adapt themselves to a slightly-acid medium were chosen, such as the bacillus coli communis, the results were no longer the same. Sabrazès and Rivière (Jour. de Méd. de Bordeaux, Nov. 26, Dec. 3, '93).

Instances tending to show that the testicular fluid prepared at the College de France enjoyed certain antiseptic properties. It can retard for a month the putrefaction of a piece of meat placed in it. Brown-Séquard (Archives de Phys. Normale et Path., Oct., '93).

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Brown-Séquard's testicular fluid contains two substances which, when injected, are useful, and substances which have a disturbing action on the metabolism. Hirsch (St. Petersburger med. Woch., S. 51, No. 7, '97).

Preparation.—D'Arsonval and Brown-Séquard recommend the following method: Take the testicles of a bull, divide each into four or five portions. Macerate for twenty-four hours in glycerin at 86° F., in the proportion of 1 quart per kilogramme of testicle. Add 5-per-cent. salt-water, ½ litre to 1 kilogramme of glycerin. Mix and allow to macerate half an hour. Filter through Laurent paper No. 8, and sterilize the filtered liquid either by carbonic acid (sterilized filter, or an autoclave with carbonic acid without filtration through porcelain) or by filtration with aluminium without carbonic acid (a process in-

ferior to the others, but simpler and within the reach of practitioners). The quantity of liquid from 1 kilogramme of testicle in the glycerin varies from 600 to 500 grammes. The quantity of glycerin is brought back by the addition of salt-water at about 15° Baumé. The liquid, in flasks containing 30 grammes, well-corked and previously well-washed in boiling water, keeps for several months without alteration.

This liquid must be injected under the skin, not pure, but one-half diluted with water recently boiled and cold. If the injection be painful, the liquid should be further diluted with water (10 to 40 drops). All vessels employed, as well as the syringe, cannula, skin of the patient, and fingers of operator should be carefully washed in 2-per-cent. carbolized water before and after injection. At least 2 grammes of the diluted fluid should be daily injected, and even 5, 6, or 8 grammes, diluted, or else 4 to 8 grammes should be injected in several places twice a week, preferably into the abdomen, between the shoulders, or into the buttocks. The treatment should be continued three weeks, and for some affections, such as myelitis and sclerosis of the cord, the time cannot be limited, but may be two or three months. Water should never be added to the liquid in the flask. The injections should be suspended if untoward effects are observed. The remedy may also be given per rectum, but diluted with water to avoid local irritation.

Another method of preparing a sterilized liquid is the following: The testicles are macerated in glycerin for twenty-four hours, and then filtered into a second apparatus through Chardin paper, which has been sterilized in carbon dioxide under a pressure of fifty atmospheres for three or four hours. It is not certain that the combined action of concentrated glycerin and carbon dioxide under a pressure of fifty atmospheres will result in perfect sterilization; therefore the use of extracts heavily charged with glycerin is persisted in. The new extracts are more active, as has been shown by experiment. The liquid should not be injected pure, but diluted with two or three times its volume of 1-per-cent. salt solution, or carbolized water, 1 per 1000. This solution should be made very slowly, so that an intimate mixture may be made. (D'Arsonval.)

Physiological Action. — Beyond the fact that it is capable of acting as a stimulant of vital energy and thus, perhaps, antagonize, to some extent, the debilitating influence of morbid processes, it is probable that suggestion plays the most important rôle in the results obtained. This, at least, is the opinion of the great majority of clinicians.

> In the great majority of cases the organic extracts act only by suggestion; sterilized water produced exactly the same effects as brain-substance, when injected in neurasthenia and hemiplegia. V. Negel (Bull. de la Soc. des Méd. et Nat. de Jassy, Nov. 1, '92).
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> If the injections were followed by the use of neutral glycerin an improvement took place. The same was the case in patients treated only by injections of diluted glycerin or of phosphate of soda, as well as in those to whom the broiled organs were administered at meals. Is not this the best proof that the effects are due to suggestion? Guelpa (Le Bull. Méd., Apr. 16, '93).
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> Experiments with transfusion of nervous extract according to the methods of d'Arsonval and Constantin Paul, in ten patients in the asylum at Reggio. These patients were all of the curable class, and in no case was there recovery, and in only one any permanent improvement under the treatment. The greatest effects from its use are to be looked for in those cases where a physical element

comes in play, and that its action is mainly through mental suggestion,—an opinion vigorously sustained by Massalongo. C. Rossi (Rivista Sperimentale di Freniatria, etc., vol. xix, No. 4).

The method acts mainly by suggestion. The cases in which benefit had been obtained were rare and did not prove the antidotal virtue of the medication. Spermin is a vital principle scattered through the entire organism. The introduction of spermin into the system would be indicated when the elements of the economy contained it in smaller quantity than normal. Fürbringer (Deutsche med. Zeit., Mar. 15, '94).

[Suggestion plays a considerable rôle in this method, when the patients to whom it addresses itself are considered. Its author is wrong in exaggerating its value. It has been said to cure tabes, then cholera, then cancer of the stomach, not to mention a trifling disease like diabetes. Charcot, however, waited in vain for the cure of a single case of true ataxia in his service. How could it be otherwise where such organic lesions were concerned? That which is destroyed is lost, and all the organic liquids are of no avail. Besides, even the exact agent of these liquids is to such a point unknown that, according to some, it is the phosphate of soda and according to others phosphorus. The truth is that injections of organic liquids have generally a tonic effect, but here their ambition should end. Dujardin-Beaumetz and Dubief, Assoc. Eds., Annual, '94.]

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In a series of experiments upon the action of orchitic extracts registered by means of a specially devised neuro-muscular apparatus, conclusion reached that capacity for work is increased by the action of such extracts, and in the fatigue as well a diminution in the subjective sensations of weariness. O. Zoth and F. Pregl (Pflüger's Archives, vol. lxii, p. 355).

Injections of the spermin of guinea-pigs made in case of cancer unsuitable for operation and insusceptible of any but palliative treatment produced an augmentation of weight, an amelioration of the general condition, and an increase of appetite. Platon (Progrès Méd., Nov. 19, '98).

Therapeutics. — In diseases of the nervous system—the stronghold of the method—the affection in which the greatest benefit was claimed was locomotor ataxy. In a series of thirty-nine cases, for instance, thirty-one were reported as either greatly benefited or completely cured. In much larger series the proportion of cures, etc., remained about the same; but, on the whole, the method has not in any way acquired the confidence of the profession, owing to the contradictory results obtained. In truth, Brown-Séquard himself did not pretend to do more than counteract the symptomatic manifestations of the disorder, and this the remedy certainly did for a time in a large number of cases. In epilepsy, however, it increased the severity and the number of paroxysms. In neurasthenia what benefit was obtained did not prove lasting.

In certain cases it is wrong to attribute the curative effects of the testicular liquid to suggestion. In certain animals the physical modifications observed in patients, such as slackening of the pulse, increase of muscular power, etc., have also been observed. The curative results are due to a special substance that gives to the nervous system a force which it lacks. As regards ataxia cured by this method, one must admit the disappearance of the symptoms, even if the lesion be not cured. Bouffé (Le Bull. Méd., June 4, '93).

As far as locomotor ataxy is concerned, testicular liquid acts by suggestion, and that this suggestive influence is all the more manifest because, for the most part, ataxic patients are doubly hysterical. The symptoms which are cured in these ataxics are precisely those dependent on hysteria. Bérillon (Le Bull. Méd., June 4, '93).

Failure in a number of cases of ataxia, sclerosis, paralysis agitans, etc.; whatever temporary amelioration occurred attributed to mental suggestion. G. W. Wood and A. T. Whiting (London Lancet, Feb. 3, '94).

No improvement whatever in some cases of tabes dorsalis in which it was tried. Carter (Liverpool Medico-Chir. Jour., July, '94).

Twenty-eight cases of epilepsy treated by the subcutaneous injection of testicular fluid submitted to the treatment for a sufficient length of time to form a fair test of its value. In eight there was slight diminution of the fits. In the other twenty the fits increased. In none of them did the intellectual state show amelioration. Bourneville and Paul Cornet (Le Progrès Méd., Dec. 9, 16, '93).

Experiments in patients suffering from neurasthenia, hysteria, pulmonary tuberculosis, and locomotor ataxy. Testicular juice has no physiological or therapeutic action upon the human organism; especially is there no action on the dynamometrical forces; it may have an irritating local action; whatever effects are observed, ephemeral and illusory, they should be attributed to the accidental variations of the disease, and principally to the action of suggestion. Magugliani (Gazzetta Med. di Pavia, May 1, '93).

Orchitic extract used in a large number of cases. All cases of nervous disease, without organic lesions, which are benefited by bromide of potassium, will receive marked benefit from orchitic extract. H. Grey Edwards (Brit. Med. Jour., June 8, '95).

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Forty cases, 30 males and 10 females, suffering from locomotor ataxy, sclerotic changes in the cord, neurasthenia, and the like, treated with from 20 to 30 minims average doses of Brown-Séquard's fluid, frequency of injections being every other day. Nausea, vomiting, and diarrhœa were caused by an overdose. Improvement was noted in nervous diseases of a chronic nature, and consisted in a general stimulation as well as an increase in the sexual sense. F. S. Pearce (Med. News, Aug. 22, '96).

Brain and Nerve Extract.

A number of observers, most prominent among which are W. A. Hammond, of New York; Constantin Paul, of Paris; and Dana, of New York, have employed extracts of brain-cortex and of nervous matter in various nervous diseases.

D'Arsonval prepared a glycerin extract made of sheep's brain and spinal cord, one part of these being emulsified with five parts of broth.

Dose.—Of d'Arsonval's glycerin extract 30 to 40 minims may be injected either into the abdominal wall or into the flank, the latter preferably, every day or every other day.

Physiological Action.—According to Althaus, extracts of brain have a twofold action: they may be looked upon as a highly-specialized pabulum of nervous matter, in consequence of their containing protagon, cerebrin, and lecithin; and, in the second place, they appear to act as antitoxins, as the phosphorized bodies split up, under the influence of the alkalinity of the blood, into glycerophosphoric acid and cholin, which have the power of stimulating intracellular oxidation and the elimination of leucomaines.

Brain and nerve extracts have also been credited with stimulating properties, manifesting themselves especially upon the heart and the general nervous system.

Therapeutics.—Hammond and Constantin Paul recorded a large number of cases of neurasthenia in which excellent results were obtained, and stray reports occasionally appear, tending to show that these extracts are occasionally used.

Four cases of neurasthenia treated with subcutaneous injections of liquid extract of cerebral matter, 46 minims

being injected three times weekly. In two cases marked improvement. Vetleser (Norsk Mag. for Læge., Mar., '95).

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It is possible to antagonize rabies by injections of the nerve-substance derived from the bulbs of sheep, which are healthy and previously untreated. M. V. Babès (Indian Med. Record, Sept. 16, '98).

Babès and Gibier recorded cases of epilepsy which appeared to be greatly benefited, while Moncorvo found sheep's brain extract of value in various constitutional affections of childhood. Dana even reported a case of bulbar paralysis apparently cured by injections of gray matter, and Montagnon mentions a case of chorea also cured by this method.

On the other hand, the negative results reported have been numerous. These, added to the active commercial enterprise which has been connected with these agents from the start, have relegated them to the rear, and it may be said that the prevailing opinion, at present at least, is that they are therapeutically worthless.

Practically every organ of the body has recently been made to contribute an "extract," but the reports are too few to warrant analysis for the present.

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ANOREXIA NERVOSA. — Nervous anorexia.

Definition.—Sympathetic or nervous anorexia may be defined as a manifestation of hysteria in which there is total absence of hunger, a distaste for food, and leading to voluntary starvation.

Symptoms.—Without apparent cause the patient expresses a repugnance for food, which gradually increases until all alimentation is persistently refused. In some cases the repugnance is so marked that tricks are resorted by the patient to avoid swallowing any aliment that may be introduced into the mouth by the attendants. Without showing any active manifestation indicative of a pathological process, the sufferer finally succumbs. This variety of anorexia is occasionally associated with melancholia. The number of respirations is usually reduced, and the temperature may be subnormal.

Case in a girl, aged 14 years, who showed no organic lesions. Respirations, 12 to 14; pulse, 46; temperature, 97° F. Cured by light food frequently administered. The patient showed a persistent wish to be constantly on the move, notwithstanding her extreme weakness. William Gull (London Lancet, Mar. 31, '88).

In marked cases the skin becomes dry, wrinkled, and cold, and the tongue is parched and sooty.

Etiology. — Hysteria is probably a factor in the majority of cases.

Case in a young girl in whom bromide of potassium caused recovery. It was learned that in the boarding-house in which the patient lived there was a girl affected with an hysterical disorder of the larynx, and that in a short time another young girl had become affected in the same manner as the patient. Schlesinger (Wien. med Blät., No. 3, '88).

Careful inquiry usually shows that the patient belongs to a more or less neurotic family. The condition usually occurs in young girls, and occasionally in children.

Case of anorexia nervosa in a girl 7½ years old, who exhibited a morbid aversion to food, and who was reduced to a skeleton, with marked mental troubles; however, after some weeks of rational nursing and treatment she was restored to physical and mental health. Collins (London Lancet, Jan. 27, '94).

Pathology.—According to Sollier, the stomach is more sensitive than is gen-

erally supposed, and its sensitiveness has a large influence on normal digestion. The organ has motor and secretory functions, the latter depending on two factors: the condition of the glandular element and the nervous system. It is therefore evident that variations in the nervous system may affect the amount of secretion. The sensitiveness of the stomach is shown in three ways: by sensation of hunger, by contact of food, and by knowledge of satiety. In the anorexia of hysteria he has often found an area

Fatal case of anorexia nervosa in a girl aged sixteen years. (*Stephens.*)

of cutaneous anæsthesia over the region of the stomach, which varies in intensity with the degree of altered sensation in the stomach itself; further, it is present only so long as the feeling of hunger is absent, and disappears when desire for food returns. It cannot be satisfactorily made out in the graver forms of hysteria, where cutaneous anæsthesia is extensive. If the mechanical functions are also involved there may be gastric atony.

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Case of hysterical anorexia in which, while there was no evidence of visceral disease, and no sugar in the urine, the breath smelled of acetone, and the urine gave a most marked reaction of aceto-acetic acid. There was vomiting, and the vomit also contained acetone. In the first, or comparatively fasting, period, acetone, aceto-acetic acid, oxybutyric acid, and ammonia were found. The amount of urine was small, and hence a considerable excretion of acetone occurred through the lungs. With sufficient nutrition the smell of acetone in the breath, the reaction with ferric chloride in the urine, and the increased ammonia excretion disappeared. Nebelthau (Centralb. f. inn. Med., Sept. 25, '97).

Diagnosis.—Cancer.—The fact that carcinoma of the stomach may be simulated by grave forms of hysteria seems scarcely possible, and yet cases are encountered in which, after long observation, the diagnosis is uncertain. Hysterical cases have even been met with in which, with all the subjective symptoms of gastric cancer, there has eventually appeared an apparently pathognomonic tumor, the growth being composed of the patient's own hair which she had swallowed.

Gastric Ulcer.—Severe pain, nausea, and vomiting, which are occasionally observed in anorexia nervosa, may suggest gastric ulcer, but the other symptoms—the character of the pain and the time at which it occurs—will usually serve to clear the diagnosis.

Diabetes.—This condition may be suggested by the facies of a case, but the degree of wasting is far greater in anorexia, and the urine does not contain sugar.

Prognosis. — Anorexia nervosa but rarely proves fatal. When great debility is reached, manifested by a dry, wrinkled, cold skin, a small, rapid pulse, and a dry, sooty tongue the likelihood is that death will ensue unless forcible means are utilized.

Two cases ending in death. The disease is rarely fatal of itself, death coming on through some other disease.

Tuberculosis has been known to supervene in these cases. Nothing prepares the soil better for tuberculosis than anorexia. Debove (Le Progrès Méd., Oct. 19, '95).

Fatal case, in a girl of 16 years, simulating diabetes. Urine normal. Up to eleven months before death the patient was a fine healthy-looking girl. After death the body weighed but forty-nine pounds. The brain and other organs found normal. Lockhart Stephens (London Lancet, Jan. 5, '95).

Treatment.—Isolation, hypnotic suggestion, hydrotherapy, gastric electrization,—intra and extra,—gavage, and lavage of the stomach have all proved useful in some cases. But occasionally these means fail. In these cases, Debove insists on the necessity of compelling the patient to eat, by whatever means, the appetite returning as the case improves.

Anorexia nervosa in a man, aged 25 years, whose weight was seventy pounds, in which compulsory feeding was employed. The patient, who had been in bed five years, gained fourteen pounds after a month's treatment. Drummond (London Lancet, Oct. 19, '95).

Hypodermic injections of morphine have been recommended, but the danger of producing morphinomania in such cases is very great. This method should, therefore, be used with the greatest of care, and only after all other means have failed.

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Three cases successfully treated in the following manner, after all other means had failed: Morphine, about ½ grain, was injected at four-hour intervals, until three doses had been given, or until there was paralysis of the stomach-wall (in two cases three doses accomplished this result). Each patient was told that she would become numb, that her pains would diminish, and that she would be able to take and retain the food that would be given to her a half-hour after the injection. The injection should be given at the same hour each day, and be followed in a half-hour by the administration of food, either with gavage or without gavage. The patient should also be assured that the food will be retained, and that it will not give rise to pain. After having used morphine in the manner indicated, these patients become hypnotizable and suggestionable in a few days. The diminution of the dose of morphine should be made progressively as soon as alimentation and assimilation have been sufficient to augment the body-weight. S. Dubois (Le Progrès Méd., Feb. 22, '96).

ANTHRAROBIN.—Anthrarobin is a product of alizarin flavopurpurin and anthrapurpurin obtained during the reduction of either of these substances. It occurs as a canary-yellow, odorless, granular powder, dissolving readily in dilute alkaline solutions, alcohol, and glycerin, but hardly at all in pure water.

Modes of Employment.—A solution varying from 10 to 20 per cent. of the excipient in alcohol or glycerin is generally preferred.

Physiological Action. — Anthrarobin is closely allied chemically to chrysarobin. Tests regarding their comparative toxicological action, when administered internally and by the skin, showed anthrarobin to be possessed of no toxic properties, even in large subcutaneous, cutaneous, or internal doses, while the greatest part of the drug appears in the urine unchanged; some has been oxidized to alizarin. Chrysarobin is changed in the system into chrysophuric acid, and is excreted as such. (Th. Weyl.)

Therapeutics.—Although anthrarobin is decidedly weaker than chrysarobin, it has the advantages over the latter that it can be applied to the face without causing a trace of inflammation, and that it is well borne during weeks and months of constant employment. Its

action is also much more powerful than that of pyrogallic acid. (Behrend.)

It has been used with the greatest advantage in psoriasis, tinea tonsurans, pityriasis versicolor, and herpes.

Applied in 15 cases of psoriasis, 17 of herpes tonsurans, 2 of erythrasma, 1 of pityriasis versicolor. The ointment, or, preferably, the tincture may be used, and the effect is enhanced if the application be preceded by washing with spiritus saponis kalinus. Results excellent. Editorial (Deutsche med. Zeitung, No. 21, '88).

Although comparatively advantageous as compared to chrysarobin, owing to the fact that it gives rise to less inflammation and that it is not poisonous, the latter is nevertheless more effective.

ANTHRAX.—Gr., ἄνθραξ, a coal.

Definition.—A malignant pustule due to infection by the bacillus anthracis, by which, from an infected centre, it may spread over the body or attack the intestinal tract, resulting in a general infection. It is also known as "wool-sorters' disease" in man and "splenic fever" in animals.

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Death of five men in Jefferson County, Pa., due to anthrax derived from handling infected hides imported from Asia. The hides had been treated with arsenic and had been washed in a neighboring creek. The trouble may have been due to drinking the water. Several cattle which drank of the water suddenly died. Editorial (Med. News, Sept. 4, '97).

Seventy-two cases of anthrax met with in a factory near Paris where skins are tanned and wool prepared. Skins and fleeces coming from Turkey, Russia, Bulgaria, and Argentine are infectious. Of the 72 cases, 62 were cured, giving a death-rate of 14 per 100. Among the hands employed in treating skins there were 57 cases among 560, 15 among 160 workers engaged in preparing wool and tails. Prophylactic measures are of the greatest importance. M. le Roy des Barres (Brit. Med. Jour., Sept. 25, '97).

Danger lurks particularly in the manes of Russian horses; so notorious is the risk that manufacturers refuse to have anything to do with them. The stuffing for chairs and sofas is another source of infection. When the material has been washed it is usually found to have diminished by 40 per cent. Editorial (Indian Lancet, Aug. 16, '97).

Symptoms.—The clinical diagnosis is not always easy. The most frequent primary lesion is in the face. The first symptom is a sense of itching, followed by a red spot resembling a flea-bite; a small vesicle forms soon afterward, containing a bluish fluid. The surrounding skin is somewhat indurated and swelled. This changes into a black spot, which soon becomes gangrenous. If the œdema continues fresh crops of vesicles often appear, undergoing the same change, and infecting the adjacent lymphatic glands. The period of incubation is from one to three days, while the development of the local symptoms occupies from three to nine days. A line of demarkation may then form, and the slough separates. No pus is present. General disturbance begins only a day or two after the manifestation of the disease. There may be no fever, but in some cases, especially when the face is involved, a sudden rise of temperature may present itself, denoting a dangerous condition.

Headache, nausea, and pain in the muscles appear, with a weak and rapid heart. There is slight icterus. The prostration is great, and the last stages of the disease finds the patient almost in the algid stage of cholera.

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Case in which high fever (104.8° F.), with delirium, feeble pulse, and sweating, developed on the fourth day, previous to

which the case had presented the characteristics of ordinary phlegmonous cellulitis. Recovery after excision, cauterization, and inoculation with cultures of bacillus pyocyaneus. C. E. Nammack (N. Y. Med. Jour., July 17, '97).

When infection takes place through the alimentary canal, the disease begins with debility, depression of spirits, malaise, and probably a chill. In addition the symptoms point to the intestines. Hæmorrhages occur from the mouth and nose; vomiting is followed by a bloody diarrhœa. The diagnosis is, however, extremely difficult, and the microscopical examination of the blood or an inoculation of an animal furnishes the only conclusive evidence.

Case of a butcher who, seven days after having cut up a cow suffering from anthrax, was attacked with a chill and fever. Two days later pustules appeared on the chest and forearm, the limb being swollen and adenitis of the axilla present; on the fifth day, coma, stiffness of the neck, convulsions, and death. At the autopsy cerebro-spinal meningitis found, with anthrax of the stomach and intestines: numerous anthrax bacilli were discovered in the cerebro-spinal fluid; they were less numerous in the endocardium, kidneys, liver, and spleen. Hitzig (Correspondenz-Blatt, No. 3, p. 87).

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Difference between effects of the localization of the pneumococcus and that of the anthrax bacillus. In the former true encephalitic phenomena are produced; in the latter, only hæmorrhages. This is evidently ascribable to a difference in the metabolic products of the respective micro-organisms. E. Fränkel (Zeit. f Hyg. u. Infectionsk., B. 27, H. 3, '98).

Etiology.—Anthrax was one of the first diseases traced to a specific micro-organism.

Pollender discovered in 1849 small rod-shaped bodies in the blood of animals suffering from anthrax, but Davaine, in 1863, proved their etiological significance. Pasteur and Koch, observing that the bacilli bore spores, cultivated them successfully outside of the body, and then produced the disease by inoculating animals with the pure cultures.

The anthrax bacilli are large rods, with a rectangular form, caused by the very slight rounding of the corners. They measure 5 to 20 microns in length and are 1 to 1.25 microns in breadth. They form long threads, in which the single bacterium can be made out. At times isolated rods occur. In this stage granular bodies appear in the protoplasm of the bacilli. They eventually form glistening oval spores, one of which lies in each segment of the long thread, giving the threads an appearance of a string of beads. The bacilli soon break up, and the spores become free. In this condition the spores become highly resisting and can be preserved a very long time. If again placed under favorable circumstances each spore will germinate into a mature cell. Spore-formation takes place only at temperatures ranging from 18° to 43° C., 37.5° C. being the most favorable temperature.

The anthrax bacilli can rapidly be stained by aqueous solutions of aniline dyes, and also by Gram's method. The spores are best stained at a high temperature by means of Ehrlich's aniline-water-fuchsin solution or Ziehl's solution containing carbolic acid, instead of Ehrlich's fuchsin solution.

The virulence of anthrax bacilli can be attenuated in various ways, such as subjecting them to a high or low temperature or making the culture grow for a long time—twenty-four days or so—at a temperature of 42° or 43° C. By treating them in some such manner it

is possible to render anthrax bacilli entirely innocuous (Koch, Loeffler). Pasteur rendered sheep and cattle immune against anthrax by inoculating them with a culture which grew at a temperature of 42° C.

Dogs, pigs, and the majority of birds are immune from anthrax; also rats and frogs under ordinary conditions. But if a frog in whose lymph-sac are placed anthrax bacilli is put in an incubating apparatus, he will quickly die of anthrax. Birch-Hirschfeld and others have proved that anthrax bacilli can be transmitted from mother to fœtus *in utero*.

Experiments to determine the influence of the serum of immunized animals. A sheep was immunized until it could bear the injection of 7 agar-agar cultures with but slight elevation of temperature. A lamb was immunized likewise to the highest degree and blood was taken from the carotid artery of both animals in order to obtain serum. With the serum of the sheep it was actually possible to save from death a rabbit in which an extremely virulent culture of anthrax was injected, either after or simultaneously with the serum. Evident therapeutic results were obtained with this serum in animals that had received the anthrax bacilli previous to the injection of serum.

The lamb's serum likewise possesses preventive and therapeutic properties, but to a much lower degree. These results permit us to hope that anthrax in man and domestic animals may sometimes be treated by serotherapy. Achille Schlavo (Cent. f. Bacterial u. Parasitenkunde, vol. xviii, No. 24, '95).

The attenuated form of anthrax is not microscopically different from the virulent form, but it is quicker in growth and more resistant. The more virulent the growth, the more acid it is, and, *vice versâ*, the more alkaline the blood-serum, the more difficult it becomes for the anthrax bacillus to grow. Behring (Zeit. f. Hygiene, Apr. 12, '89).

Experiments on rabbits and sheep to ascertain relative value of serum-therapeutics and vaccination. Intravenous injections of small doses of virus are not more severe than subcutaneous ones, but large quantities are far more lethal when given in the veins. A sheep vaccinated is refractory to a large dose of anthrax, but its serum has no curative power. When immunized to a very high degree, the curative power of the serum may become marked from two to three weeks after inoculation, after which its activity diminishes. By intensive inoculation of sheep a serum is obtainable, having distinct prophylactic properties. As to the curative properties of the serum, that obtained from rabbits was not found strong enough to avert death. The immunity produced by this serum is evanescent; that resulting from vaccination was, on the contrary, lasting. Marchoux (Annales de l'Institut Pasteur, Nov., '95).

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No immunizing substances found in the blood either of animals treated with Pasteur's vaccine or of those who had passed through an attack of anthrax. In animals treated for weeks and months with increasing doses of virulent anthrax cultures so that an active immunity is acquired, such protective substances are present in the blood. The serum obtained from a sheep thus treated conveyed a certain degree of immunity when injected into rabits. Attempts at cure of the disease in rabbits were without effect. In 2 out of 7 sheep in which 100 to 150 cubic centimetres normal serum from a lamb were first injected, then small quantity of a virulent anthrax culture, both animals succumbed. Three other animals were given a single dose (50, 100, and 200 cubic centimetres of serum) and later a virulent anthrax culture. All these animals recovered. The sixth and seventh animals were also injected with smaller virulent cultures and later with anthrax serum. Both recovered. Sobernheim (Berliner klin. Woch., Oct. 18, '97).

Experiments showing the comparative

value of alkaline solutions for the destruction of spores. Cultures of anthrax bacilli rubbed up into an emulsion, the bacilli killed by exposure to a temperature of 158° F., and remaining spores subjected for several days to the action of solutions containing carbolic acid alone, and other solutions containing in addition to carbolic acid in the same strength salts such as sodium chloride, sodium phosphate, and the like. The latter solutions proved much more active in preventing the growth of the spores. When the spores were first introduced into a solution of sodium chloride and then into a mixture of a similar solution and carbolic acid, the growth of spores was much less active than when the simple salt solution was not used first. The author believes that the salts act by increasing the precipitation of proteids rather than by changing the molecular constitution of the carbolic acid. Römer (Münch. med. Woch., Mar. 8, '98).

Prognosis.—The prognosis of anthrax in man, when infection takes place externally, depends mainly upon whether energetic surgical treatment is undertaken early enough. Lengyel and Koranyi, by adopting suitable local treatment, lost only thirteen out of one hundred and forty-two cases. Patients with anthrax resulting from internal infection (intestinal, pulmonary) very rarely recover. (Tillmann.)

Prophylaxis.—The fact that French skins, since Pasteurian inoculation has been employed in French flocks, have been found to rarely cause anthrax speaks in favor of that method. Disinfection, even by formol, is uncertain.

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Skins of French animals are never infectious, the result, it is believed, of anthrax being almost stamped out among the French flocks by the practice of Pasteurian inoculation. Formol-vapor does not penetrate them sufficiently to disinfect thoroughly. The only safeguard against anthrax infection is the Pasteurian inoculation. M. le Roy des Barres (Brit. Med. Jour., Sept. 25, '97).

Treatment.—In man the disease remains localized a longer time than in animals. Hence it is possible to remove it more thoroughly. Complete extirpation of the affected part, by means of the Paquelin thermocautery, and subsequent cauterization with nitric acid are to be practiced.

Complete excision of the pustule is the best treatment, except when vital structures are involved, in which case injection of strong solutions of the most energetic antiseptics may be used. H. L. Burrell (Annals of Surg., p. 621, '93).

According to Koch, bichloride of mercury is the most effective poison for the anthrax bacilli, being capable of killing them when used as diluted as 1 part to 300,000 of water. Consequently it is a good plan to use, in and around the affected part, injections of 1 to 100 bichloride or 2- to 5-per-cent. carbolic acid. General treatment has been very unsatisfactory, although Russian authors have met with success by the energetic use of carbolic acid locally and internally.

Theoretical considerations should never deter one from operating, not only during the early stages, but at whatever period of the disease the cases present themselves. There are a number of instances where success has followed excision even in the later stages. It seems that we have in the pustule a manufactory which supplies bacilli, in unlimited quantities, and, when this is removed, the phagocytes are well able to cope successfully with the organisms which have escaped in the blood-stream. Lowe (London Lancet, Jan. 23, '92).

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Case of anthrax of the nose in a tanner successfully treated with injections of carbolic acid and hot compresses (122° to 131° F., changed every ten minutes, day and night). In the course of eighteen

days more than 400 Pravaz syringefuls of 3-per-cent. solution of carbolic acid were given without signs of intoxication's appearing. Alexander Strubell (Münch. med. Woch., Nov. 29, '98).

The fact that experiments have shown that ipecacuanha added to tubes containing 5 cubic centimetres of broth invariably destroy the vitality of all the anthrax bacilli present, and no growth ensued (provided that they contained no spores) has suggested the use of this drug as a remedy.

Ipecacuanha, locally, in form of powder and internally in doses of 5 grains every four hours advocated. Fifty cases so treated without a death. Maskett (Med. Chronicle, Aug., '91).

Nucleinic acid has also given promising results in the hands of Vaughan.

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Intravenous injections of nucleinic acid into animals previously inoculated with anthrax. Eighty per cent. of the animals inoculated survived. Of those not treated 20 per cent. survived. Treatment with nucleinic acid begun in from five to twenty-four hours after the anthrax inoculation. V. C. Vaughan, C. T. McIntosh, and G. D. Perkins (Boston Med. and Surg. Jour., June 18, '96).

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ANTIPHTHISIN. See Tuberculosis.

ANTIPYRINE. — Phenazonum (Br. Ph.); antipyrinum (Ger. Ph.). Antipyrine is an alkaloidal product from the destructive distillation of coal-tar, discovered by Knorr. It is known chemically as dimethyl-oxy-quinizine of phenyl-dimethyl-pyrazole (organic base from oxyphenyl-methyl-pyrazole). It is known also as analgesine, methozine, parodyne, phenylone, and sedatine. It occurs as a fine, white, crystalline powder, and is soluble in chloroform, in an equal weight of water, in 2 parts of alcohol, and in 50 parts of ether. It melts at 105°-113° C. (210°-235.4° F.) according to dryness. It has antipyretic, analgesic, sedative, styptic, and antiseptic properties. The following substances incompatible with antipyrine are said to precipitate the drug from concentrated solutions: Carbolic acid in saturated solution, tannin (a white insoluble precipitate), mercuric chloride (white precipitate soluble in an excess of water), infusion and tincture of catechu; infusion, fluid extract, and tincture of cinchona-bark; infusion of rose-leaves, infusion of uva ursi, tincture of hamamelis, tincture of iodine (precipitate soluble in water), tincture of kino, tincture of rhubarb; solutions of chloral, arsenic, and mercury; and alkalies.

In the following mixtures antipyrine is decomposed: Calomel forms with antipyrine a toxic combination; antipyrine in decomposed when rubbed up with betanaphthol; with chloral, antipyrine forms an oleaginous liquid; with sodium bicarbonate it disengages the odor of ether; with equal parts of sodium salicylate it forms an oleaginous mixture.

The following substances produce coloration when added to aqueous solutions of antipyrine: Hydrocyanic acid: dilute solution—yellow; nitric acid: dilute solution—pale yellow; ammonia alum: dilute solution—dark yellow; amyl-nitrite: acid solution — green; nitrous ether: alcoholic solution—green; ferrous phosphate: yellow-brown; ferric sulphate: blood-red; ferric chloride: blood-red; syrup of iodide of iron: red-brown.

Dose.—The usual dose for adults is 15 grains in powder or dissolved in water, syrup, or elixir, every two to six

hours, or four or five times daily. The maximum single dose for an adult is 20 grains. The maximum doses for children are: 6 months to 1 year, 3 grains; 1 to 3 years, 4 to 5 grains; 4 to 5 years, 4½ to 6 grains; 6 to 8 years, 7½ to 9 grains; 10 to 12 years, 9 to 10½ grains. Generally, it will be found that small doses, repeated at intervals of two hours, are attended with therapeutic effects and with less danger of untoward symptoms than larger doses given at longer intervals.

Literature of '96-'97-'98.

Caution against the simultaneous use of antipyrine and calomel. Their reactions result in the formation of a dangerous amount of corrosive sublimate, even when ordinary medicinal doses are given. H. Werner (Pharm. Zeit., June 10, '96).

It is not safe to prescribe antipyrine and calomel together, because they are incompatible. An amount of bichloride may be generated which may produce toxic effects. It may not happen in every case, but it has happened in some cases,—one within my personal knowledge. W. J. Robinson (N. Y. Med. Jour., Feb. 13, '97).

Antipyrine and sodium salicylate cannot be dispensed together in powder form; immediately, or within a short time, liquefaction takes places, and when the powders reach the patient he is likely to find no powder at all, but only thoroughly soaked pieces of paper. W. J. Robinson (N. Y. Med. Jour., Oct. 30, '97).

In giving the drug the personal idiosyncrasy of the patient should be considered, as well as the integrity of the urinary and cardiac functions. A dose which would be safe for a person with healthy heart and kidneys might cause dangerous symptoms in a case where these organs are diseased. (Lépine.)

Literature of '96-'97-'98.

Case of idiosyncrasy to antipyrine. Author suffered from migraine and used to be in the habit of taking 15 grains of antipyrine during the attacks. These were followed by the occurrence of small, aphthous ulcers on the mucous membrane of the lips, cheeks, and tongue, which healed very slowly. Another time his lower lip became swollen and œdematous, and in two hours an ulcer appeared on the tongue. Several others shortly afterward formed on his lips and cheeks, and took fourteen days to heal. In addition he suffered from dermatitis about the genital region. Another case of the same nature met with in practice. Intolerance of the same kind gradually developed in him to all drugs of the same class,—quinine, antifebrin, phenacetin, and sodium salicylate,—which he had used to check the migraine. Steinhardt (Ther. Monat., Nov., '96).

Case of a young man who had often taken antipyrine without discomfort until he was 17 years of age, when he suffered from typhoid fever, and developed marked intolerance to this drug. In the course of the following year he took it several times, once a dose of 15 grains, afterward half this dose, then only 3 or 4 grains, and finally between 1 and 2 grains. Even after the smallest dose unpleasant symptoms appeared. At first there were marked twitchings in the genital and anal regions. In a few days there appeared here numerous blebs, which burst and formed scabs. On the gums there appeared also little blisters. The remarkable fact in this case is that intolerance developed after typhoid fever. (Jour. de Méd. et de Chir., Dec. 25, '96.)

A review of cases in which dangerous symptoms or death had followed, suggests that antipyrine should not be given in antipyretic doses to fever patients, because it interferes with the action of the kidneys, and that in febrile conditions complicated by nephritis (pneumonia, typhoid fever, tubercu-

losis, etc.) it is contra-indicated. It must be avoided in true angina pectoris, because it acts injuriously on the heart-muscle, and there is always danger of cardiac dilatation in this affection. In the neuralgic form of angina pectoris there is no reason for preferring its hypodermic use to that of morphia. Weakness of the circulation, too, is a contra-indication to antipyrine. (Eloy.)

Warning against its employment in all cases in which the kidneys are diseased, since its elimination is interfered with, and toxic effects might arise. Arteriosclerosis should not be treated by it, even when the kidneys are not affected. Huchard (Jour. Amer. Med. Assoc., July 7, '88).

Contra-indications for the employment of antipyrine: a weak heart; diphtheria, with phenomena of myocarditis; profuse hæmorrhages; in debilitated subjects; convalescence from chronic fevers; and the night-sweats of tuberculous patients. B. Martin (L'Union Méd., Oct. 20, 22, 27, '91).

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Persons suffering from erysipelas seem to be peculiarly susceptible to antipyrine. It usually causes anuria and a profound fall of temperature, requiring caffeine and hot applications. Erysipelas is one of the infectious diseases in which antipyrine is contra-indicated. Spanoudis (L'Abeille Méd., Mar. 27, '97).

Antipyrine should never be prescribed for very old people, for subjects attacked with non-compensated cardiac lesions, or for those in an adynamic condition. In influenza and erysipelas it should always be associated with quinine, and, in convalescence, with strychnine or caffeine. In arthritic subjects, who are nearly always dyspeptics, it should be associated with an alkali (sodium bicarbonate or sodium benzoate) and prescribed in solution. If it cannot be taken except in a capsule, the patient should drink a quarter or half a glass of Vichy immediately after taking the capsule. In tuberculous subjects 12 grains at a time should not be exceeded, and the condition of defervescence should be carefully watched. It is well, in this case, to combine alcohol and antipyrine and give the latter in solution. In diabetic subjects the association with alkalies is obligatory. In children antipyrine may be administered without inconvenience even in amounts proportionately larger than in adults, provided it is given in divided doses. This tolerance depends as much upon the integrity of the renal function as upon the mode of administration, which should nearly always be by the solution. M. V. Clément (Gaz. Heb. de Méd. et de Chir., Sept. 26, '97).

Physiological Action.—Antipyrine is excreted by the kidneys, and may be found unchanged in the urine. Perret and Givre have shown that, no matter what the age of the person may be, elimination by the urinary tract begins at the same time, varying from three-fourths of an hour to an hour. They found, however, that the elimination is finished sooner in the child than in the adult, and likewise in the adult than in old age. The conditions causing accumulation in the system do not influence in any manner the time of the appearance of antipyrine in the urine, but notably increases its duration. Any of the substances producing coloration when added to aqueous solutions may be used as a test to detect the presence of antipyrine in the urine, but ferric chloride is most generally employed for the purpose, detecting antipyrine in dilutions as high as 1 to 100,000.

The elimination of antipyrine when given by the rectum occurs from the mucous membrane of the stomach, in from one-fourth to one-half hour before taking place by the kidneys. P. Kandidoff (Wratsch, No. 13, '93).

Antipyrine appears in the urine forty minutes after its ingestion by the stomach and thirty minutes after its intro-

duction by the rectum. Lamanski and Main (Le Bull. Méd., Jan. 29, '93).

Antipyrine may be excreted from the rectum, the mouth, or from the subcutaneous connective tissue when given by hypodermic injections.

When a medium dose (10 to 15 grains) is given, we notice a fall of temperature, from one to five or more degrees, at the time the temperature becomes very subnormal. This reduction of temperature is apparently not due to the diaphoresis induced, which is sometimes small in amount, but by its inhibitory action upon the heat-regulating centres in the nervous centres. This action is seen in health as well as in disease. With the reduction in temperature is noticed an increased action of the sweat-glands, perspiration being seen first about the forehead and neck, and later upon the chest and face. Chilly sensations, which may be experienced if the sweating is excessive, can be removed or prevented by the exhibition of stimulants: atropine or agaricin. Stimulants will also prevent the depressing action upon the heart.

With the calorimeter of d'Arsonval heat-dissipation found to be decreased, there being a corresponding diminution in the process of heat-production. Destrée (Jour. de Méd., de Chir., et de Pharm., July 20, '88).

The reduction of temperature produced by antipyrine is exclusively due to increase of heat-dissipation, while the phenomenon of heat-production remains unaffected. Gottlieb (Arch. exper. Path. u. Pharm., vol. xxviii, H. 3, 4, '91).

Antipyrine produces a decided fall of temperature in the first hour after its administration in the fevered animal; this reduction is due to a great increase in heat-dissipation, together with a fall in the heat-production. Cerna and Carter (Notes on New Remedies, Sept., '92).

The pulse is generally reduced in frequency concurrently with the fall in temperature, but not in the same ratio, and sometimes not at all. The blood-pressure is usually increased with the fall of temperature, but is occasionally reduced by reason of a dilatation of the peripheral blood-vessels. The heart-beat is generally reduced and the force of the systole is lessened, at least to some extent, and in this lies the great danger attached to its use: a contrary effect to that produced by quinine, which sustains the heart.

[Antipyrine does not alter and certainly does not produce a lowering of the arterial pressure. HARE and CERNA, Assoc. Eds., Annual, '92.]

In regard to the influence of the drug upon the secretion of urine, experiments have shown that the quantity is diminished in twenty-four hours; this is also the case as regards the amount of urea eliminated under its use.

In six healthy subjects 30 to 45 grains found to diminish the quantity of the urine from 20 to 40 per cent.; in several cases of disease this decrease was still more marked. If, for instance, the average diminution of the solids in healthy persons averaged 10 per cent., in typhoid fever this percentage of decrease was greater. When the disease is a chronic one the diminution is more marked than if it is an acute malady; diminution is greatest in those diseases in which nutrition is compromised most severely. Robin (Gaz. Méd de l'Algerie, Jan. 15, '88).

Antipyrine in doses of 30 grains causes an increase in the number of leucocytes in the blood and a decrease in the quantity of uric acid eliminated by the urine. J. Horbaczewski (Litzungs b. d. K. K. Wiener Akademie der Wissen., p. 101, '92).

Antipyrine, in doses of 30 grains, causes a diminution in the quantity of uric acid eliminated by the urine and an increase in the number of leucocytes in

the blood; unlike quinine, it does not produce atrophic changes in the spleen. J. Horbaczewski (Bull. du Comite Agric. du Dept. de l'Aube, T. C., Sec. 3, p. 101, '92).

Antipyrine Poisoning.—The use of antipyrine is not always void of danger. Very unpleasant, even dangerous and fatal results are on record. The dose does not always determine the effect produced, and it would seem that some persons are extremely susceptible to its toxic action. In addition to idiosyncrasy, a diseased condition of the brain, heart, or blood-vessels, and especially of the kidneys (organs eliminating antipyrine) seems to heighten the effects of the drug on the system, so much so as to interdict its use altogether.

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Antipyrine is a dangerous drug. It ought to be scheduled as a poison, only to be dispensed on a written order from a qualified medical practitioner. By combining some preparation of ammonia with antipyrine, the latter drug can be prescribed with less fear of unpleasant sequelæ. H. W. McCaully Hayes (Brit. Med. Jour., Feb. 1, '96).

The toxic effects of antipyrine when ingested are, in general, those of an irritant poison: abdominal pain, nausea, heart-burn, and in some cases vomiting, intense colic, and diarrhœa. These effects may be avoided by rectal administration of the drug. In addition to these effects upon the gastro-intestinal tract, we notice a diminution of body-heat, in some cases becoming subnormal, the skin becoming cold, cyanotic, and covered with a clammy perspiration, sometimes followed by unconsciousness, collapse, coma, convulsions, and even death. In rare cases an elevation of temperature follows its use (paradoxical action), possibly due to interference with renal function and the presence of urea or leucomaines in the blood; several cases of this action have been reported. The administration of 15 grains has been followed, in several cases reported, by violent sneezing, a copious watery discharge from the eyes and nose, constriction about the throat, loss of voice, and dyspnœa, with a sense of intense burning in the nose, mouth, eyes, ears, and throat and distressing tinnitus aurium. Vertigo attended by dyspnœa, and a feeble, fluttering, and intermittent pulse are not infrequently observed. Disturbance of the vasomotor system is observed in some cases, resulting in œdema (sometimes of the glottis, causing suffocation) of the extremities or face with a diminution in temperature and a tendency to cyanosis and collapse.

Literature of '96-'97-'98.

Case of poisoning by antipyrine. Within a quarter of an hour after taking a dose of 10 grains the patient felt very ill. His face was cyanosed, his lips and nose swollen and blue, and his eyes almost closed from swelling of the eyelids; skin was cold and clammy; sweating; pulse, 128, very weak, small, and compressible. Pupils widely dilated. Administered 5 grains of carbonate of ammonia, $^1/_{50}$ grain of digitaline, $^1/_{60}$ grain of strychnine, and $^1/_2$ ounce of vinum aurantii. The next quarter of an hour his condition improved as far as the symptoms of cardiac depression were concerned. Recovery. H. W. McCaully Hayes (Brit. Med. Jour., Feb. 1, '96).

Case of an anæmic girl of 19, who took a draught containing 5 grains of antipyrine and 7 grains of bromide of potassium, with a drachm of compound spirit of ammonia. Toxic symptoms appeared about ten minutes after the draught was taken. A few minutes later the following conditions were present: Cold shivers, severe and gasping dyspnœa: the face was swollen, especially about the eyes, so much so as to prevent any pos-

sibility of opening them or of seeing, except with great difficulty, the pupil; and the body was covered with a bright-red rash, like scarlet fever, resembling that of urticaria, so that it presented wheals, which were of different sizes,—from that of a small papule to some as large as five-shilling pieces. The temperature in the axilla was 97° F., and the pulse, which was very intermittent, was only 50. She complained of no pain. The tongue was very dry. The lips and general aspect were decidedly cyanotic. Stimulants, with strychnine and digitalis, were given. The shivering passed off in about three hours, but the other symptoms continued for about eight hours. The rash did not disappear for thirty hours. E. Webster (Lancet, Jan. 30, '97).

Poisoning by antipyrine in a middle-aged woman, convalescent from typho-malarial fever. After taking 10 grains of antipyrine, 20 minims of spiritus ammoniæ aromaticus, and 1 ounce of water, she was very pale, but not cyanotic; no swelling of the eyelids, but almost complete loss of sight; rash, which disappeared in about eighteen hours, resembling that of urticaria. Patient rallied well on the administration of hot coffee and whisky. Recovery. F. G. Wallace (Lancet, Feb. 6, '97).

Case of a woman, aged 50 years, poisoned by 7 grains. After an hour: swelling and redness of the upper lip. After three hours: pain in the eyes; paralysis, swelling, and smarting of the tongue. Speech difficult; salivation. An hour later: chilliness, sensations of heat; and, later, syncope, vomiting, and diarrhœa. The next morning there was an eruption upon the face, arms, hands, and thighs which resembled scarlet fever, with marked burning and itching about anus and vulva that gradually extended over the whole body. These symptoms gradually disappeared in two weeks. Severe desquamation. Scheel (Ther. Monat., H. 3, S. 161, '97).

Case showing that antipyrine may unexpectedly prove poisonous in a small dose (7 ½ grains, in this instance) in a person who has shown no special idiosyncrasy toward it, after taking the drug on many previous occasions. Eisenmann (Ther. Monat., Apr., '97).

The toxic action of antipyrine on the blood seems to be a transformation of its oxyhæmoglobin into methæmoglobin.

The action of antipyretics on the blood when administered in toxic doses may be summed up as a transformation of oxyhæmoglobin into methæmoglobin. A phase of anæmia, or diminution of oxyhæmoglobin, precedes the accumulation of methæmoglobin. In this period there is at the same time production and elimination of methæmoglobin; if elimination be hindered or transformation be too rapid, phenomena of cyanosis may be produced which must be distinguished from those of the period of intoxication. Hénocque (La Semaine Méd., Mar. 27, '95).

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Blood of frogs and blood taken from the cyanosed lips and other parts of a rabbit, both ante- and post- mortem, examined spectroscopically. The rabbit had died from toxic effects of antipyrine, yet the spectrum of methæmoglobin was certainly not present. Andres Halliday (Montreal Med. Jour., July, '97).

The poisonous effects of antipyrine upon the nervous system have been studied by Langlois and Guibaud. By graduated doses, given to animals whose spinal cord had been divided below the medulla oblongata, they discovered several stages of antipyrine poisoning. First, a cerebral stage, in which clonic epileptiform convulsions are limited to the head; second, a cerebro-spinal stage, in which the head is still affected with clonic convulsions, while the trunk is attacked with one or more tonic spasms (opisthotonos); third, a cerebral stage, with spinal hyperirritability, in which the shocks caused by the clonic convulsions of the head set up violent reflex movements of the body, comparable to the spasms of strychnine poisoning;

fourth, the reflexes of the head disappear at the same time as those of the trunk. Antipyrine has, then, an elective action in the higher centres, and this explains why its sedative action is more marked in head affections than in spinal.

Experiments apparently proving that the main action of the drug is upon the nervous system, not in its peripheral portions, but rather upon the spinal cord and brain. Batten and Bokenham (Brit. Med. Jour., June 1, '89).

Experiments sustaining Batten and Bokenham as to the effect of the drug upon the spinal cord, and in its local and general action as a sedative to the sensory nerves. Also in accord with most observers in the statement that antipyrine does not affect the circulation to any extent in moderate doses. Simon and Hoch (Johns Hopkins Hosp. Bull., Apr., '90).

The deleterious effects manifested in the cutaneous system are very varied. There may be merely a sensation of great itching or burning without the appearance of any eruption, which disappears rapidly upon the discontinuance of the drug. If an eruption appears, it may take the form of erythema, urticaria, petechiæ, or papule, or resemble in appearance one of the exanthemata, —measles, scarlatina, etc. In rare cases we note discoloration of the face and of the mucous membrane of the mouth, swelling of lips, tongue, and salivary glands, with epileptoid attacks, amaurosis, tinnitus, deafness, and delirium. In rarer cases the ingestion of antipyrine is followed by the appearance of albuminuria, hæmaturia, ischuria, or strangury.

Urticaria produced rapidly by a single dose of 10 grains of antipyrine. E. Knight (Brit. Med. Jour., May 18, '95).

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Case in which entire surface of the body was covered with a copious eruption exactly resembling in appearance that of a severe case of measles; the face and eyelids were also swollen, after taking 10-grain powders of antipyrine twice daily for three weeks. No symptoms of cardiac depression appeared to be produced by the drug. Webber (Lancet, June 6, '96).

Case of a gouty person of 65 years, who had often taken antipyrine without bad effects. One day a dose of 30 grains caused aphthous stomatitis, while an injection of 15 grains produced an ulcerative stomatitis with a purpural eruption. Dalche (Med. News, Feb. 13, '97).

Case of a woman of 33 years, who, several hours after the ingestion of antipyrine, developed a general pemphigus-like eruption upon the skin and also upon the buccal mucous membrane. This condition lasted ten days. There was also a scanty urine, but no albuminuria. Opinion that eruptions are only likely to occur in persons with renal lesions. Lyon (L'Abeille Méd., Mar. 27, '97).

Case in which the eruption was accompanied by a stomatitis. Blondel (L'Abeille Méd., Mar. 27, '97).

Case in which there was œdema of the lower extremities and the vulva, with blebs forming under the skin after full doses. These symptoms ceased when the drug was stopped. Goldschmidt (L'Abeille Méd., Mar. 27, '97).

Case of a woman who had syphilis in 1894, for which she was thoroughly treated. Near three years later syphilitic manifestations appeared, which disappeared under treatment. In April, 1898, she took 7 ½ grains of antipyrine on account of headache, and on following day had a crop of vesicles in the mouth, which soon disappeared. A few days later she took another dose of 7 ½ grains of antipyrine. In the same evening she shivered, and was feverish, and had an urticarial eruption over the body. On the next day there were numerous vesicles on the mucous membrane of the cheek, soft and hard palate, upper and lower lips, and also on the vaginal mucous membrane. Patient thought this relapse of the syphilis. In four days vesicles began to dry up, but food was

taken with difficulty. Urticaria-like rash had now disappeared. Nothing but simple treatment used. Immerwahr (Berliner klin. Woch., Aug. 22, '98).

In some cases there is a marked resemblance between antipyrine poisoning and the algid stage of cholera.

Case in which there was severe collapse, cold extremities, vomiting, hoarse voice, and sunken eyes. The stools, however, were solid, and there was a deep, rose-red rash on the patient's body. His radial pulse could not be felt. He answered questions slowly, complained of headache and noises in his ears, and had disturbed vision. He had taken 2½ drachms in 15-grain doses twice daily. Recovery under the use of stimulants. Guttmann (Ther. Monat., Oct., '92).

Case of a girl of 20 years, who took 81 grains of antipyrine for the relief of headache. She did not lose consciousness, but the pulse became almost imperceptible, reaching 200 per minute. She recovered under absolute rest, strong coffee internally, and ice externally. Krysinski (Gazeta Lekarska, No. 39, '93).

The dangerous and uncertain action of antipyrine in many cases renders precaution highly necessary. When the drug is known to disagree its use should be avoided. When disease of the heart, functional or organic, or of the kidneys is present, antipyrine should not be given or if necessary or expedient, it should be carefully guarded by administering stimulants simultaneously. During lactation antipyrine should not be given unless we wish to control the function or cause the milk to disappear.

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Antipyrine certainly passes in a natural state into the milk. Given in large doses, in two capsules each containing 15 grains, at intervals of two hours, it may be detected in the milk in from five to eight hours after its ingestion, while from nineteen to twenty-three hours afterward none can be found; hence elimination lasts eighteen hours at the maximum. The antipyrine during this time passes into the milk only in an excessively weak proportion, very much less than fifty parts in a thousand; it is only in exceptional conditions—for instance, when 60 grains are administered in sixteen hours—that it perceptibly reaches this proportion. It does not influence, in any way, the quality of the milk and, particularly, the lactose, the casein, or the fat. It seems to have no action at all on the secretion, which always remains very abundant, provided the woman continues to nurse. From the absence of general symptoms and from examinations of the weight, the infinitesimal quantity absorbed by the nursling does not seem to have any unfavorable action. M. G. Fieux (Bull. Méd., Sept. 5, '97).

Antipyrine in nineteen cases to suppress the lacteal secretion. It was given every two hours in capsules containing 4 grains, and a longer interval was allowed to pass between the dose which preceded and that which followed the two meals of the day. The results in all the cases were very favorable. After the absorption of the antipyrine the breasts became empty and soft, and the lacteal secretion was completely exhausted. Antipyrine is one of the most inoffensive medicaments for the suppression of the lacteal secretion known. Guibert (Jour. des Prat., Apr. 17, '97).

Arteriosclerosis and depressed conditions of the system (typhoid fever associated with weak heart, typhoid pneumonia, etc.) contra-indicate the use of antipyrine.

Treatment of Antipyrine Poisoning.—If a patient is already suffering from antipyrine poisoning our chief reliance must be placed upon stimulants: brandy, ether, ammonia, atropine, and heat applied to the extremities seem best to meet the indications. As the symptoms are those of collapse, all efforts should tend toward the restoration of body-

heat and normal heart-action. The presence of any renal difficulty will suggest its own appropriate treatment, in addition to that used primarily to combat the toxic effects of the antipyrine on the heart. Sodium bicarbonate is recommended as an antidote to antipyrine by Lépine, of Lyons, who prefers it to atropine.

Local Use.—Saint-Hilaire and Coupard have employed antipyrine locally in affections of the throat and larynx attended with symptoms of exaggerated sensibility, and have demonstrated its anæsthetic properties. They advise a solution of 1 part of the drug to 2½ parts of distilled water, used in an atomizer. Cazeneuve, of Lyons, has found antipyrine serviceable in cystitis with ammoniacal urine used in a 4-per-cent. solution. The pain is diminished and the character of the urine is modified.

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In cases of acute tonsillitis a gargle, composed of 2½ drachms of antipyrine, 2½ drachms of chlorate of potassium, 3 ounces of peppermint-water, and 8 ounces of distilled water, is useful whenever the painful crises occur.

Antipyrine has also been recently recommended as a local anæsthetic in operations on the male tunica vaginalis, in acute tonsillitis, and in the removal of small tumors from the skin. In hydrocele of the tunica vaginalis, after the fluid has been removed, a 10-per-cent. solution of antipyrine in water is injected and allowed to remain in contact with the serous membrane five minutes before the tincture of iodine is applied. This method entirely dispenses with the pain of the latter application. L. Mercière (Archives clin. de Bordeaux, Aug., '96).

As a substitute for cocaine in a number of cases of urethrotomy, a 10-per-cent solution of antipyrine in 1-per-cent. solution of carbolic acid used. The solution appears to be quite as efficacious as cocaine. The solution should be fresh, and should be allowed to remain in the urethra for ten minutes, as a rule. Unlike cocaine, the styptic effect of antipyrine is not followed by vascular relaxation and often almost uncomfortable hæmorrhage. G. Frank Lydston (Jour. Cut. and Genito-Urin. Dis., May, '98).

For operations in the pharynx and larynx, a 10-per-cent. solution of cocaine should be applied, followed by parenchymatous injection of 50-per-cent. antipyrine, the dose of the latter being 3 to 6 grains. Complete local anæsthesia ensues in from 10 to 15 minutes and lasts 8 to 12 hours. Wroblewski (Medicine, Feb., '98).

As an anæsthetic in cases of parturition, antipyrine is useless for the pains of a perfectly normal labor, but finds its chief value in those cases where the pains are so excessive as to reflexly interfere with the proper uterine contractions. It is also useful when the liquor amnii has been discharged too early and where there is rigidity of the os. In regard to the second stage of labor, antipyrine is useless. There is evidence, however, that antipyrine has considerable ability to relieve the so-called after-pains. It is also seemingly a fact that antipyrine may be used with some success for the purpose of quieting a tendency to the development of pains before the full term has been reached. If it is intended to use antipyrine for the purpose of arresting a threatened miscarriage, then its dose must be very large: as much as 30 or 40 grains given in two or three doses of 15 grains each, at half-hour or hour intervals. (Misrachi, Hare.)

In a comparative study of all the anæsthetic agents which have been employed or experimented with in parturition, antipyrine has only given moderate results. Chaigneau (Jour. de Méd. de Paris, Apr. 19, '91).

Antipyrine has a powerful hæmo-

static action when applied locally. It acts by vasoconstriction and retraction of the tissues, with the formation of a minute clot, which is extremely retractile and aseptic. In epistaxis antipyrine may be employed in a 20- to 50-per-cent. solution to the bleeding-point by means of a tampon. For ordinary use as an hæmostatic, a 10-per-cent. solution is sufficient. Park, of Buffalo, advises a sterilized 5-per-cent. solution used as a spray, on compress, or as injection.

As early as 1884 the hæmostatic properties of the drug had been noted, and it was suggested by Arduin that the drug might be used for the same purposes as iron perchloride and ergot. H. Huchard (Revue Gén. de Clin. et de Thér. Jour. des Prat., Nov. 9, '95).

Antipyrine is particularly indicated in epistaxis, in a $^1/_2$ or $^1/_5$ solution to the bleeding-point by means of a tampon. For ordinary use as an hæmostatic a $^1/_{10}$ solution is sufficient. It is also of value in dental, tonsillar, and uterine hæmorrhages. X. Grêpin (Thèse de Paris, July, '95).

A 5-per-cent. solution may be used as a spray (sterilizing the water before making the solution) upon any surface, peritoneal, cerebral, or other, from which parenchymatous oozing is taking place, complicating or jeopardizing the success of dressing. Also useful in the urethra and even in the bladder, in cases of hæmaturia proceeding from either of these locations. In the eye it may also be used without fear, preceding its use by that of a weak solution of cocaine. R. Park (Med. News, Nov. 16, '95).

Hypodermic Use. — Antipyrine has been used subcutaneously in various affections, but its use in this way is followed by excruciating pain, which lasts about half a minute, and by abscess and gangrene in some cases. Such injections are believed to be particularly injurious where neuritis is the prominent lesion.

The severe, though temporary, pain of the hypodermic administration of antipyrine is the greatest objection to this method of its employment. To obviate this, the syringe is filled three-fourths with the antipyrine solution; a solution of cocaine, containing about $^1/_4$ grain is then drawn in. Given in a region where the skin is lax, the injection is painless. H. du Fougeray (Gaz. des Hôp., Mar. 3, '88).

The subcutaneous injection of antipyrine can be rendered painless by giving an injection of $^1/_{16}$ grain of cocaine three to five minutes beforehand. Von Bricken (Ther. Monat., July, '88).

One hundred and thirty-eight injections to seventy-five patients with different diseases, the object being to relieve pain. Success attended the procedure in 80 per cent. of the cases. The injection should be made deep into the subcutaneous connective tissue, but is always a very painful procedure. F. Merkel (Münchener med. Woch., Aug. 14, '88).

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Since the beginning of hypodermic treatment, some way of administering quinine in this way needed, especially in severe malaria. The difficulty may be overcome by using Laveran's formula (hydrochlorate of quinine, 3; antipyrine, 2; distilled water, 6), giving a 50-per-cent. solution, of which the injection is painless. This solution, extensively used by Blum in 1894 during a severe malarial epidemic in Algiers, was always found satisfactory. Santesson (Deut. med. Woch., B. 2, Sept., '97).

If injections of antipyrine do not always relieve sciatica it is because they are not made deep enough, so as to bring the analgesic actually into contact with the nerve-trunk. Kuhn (La Sem. Méd., Mar. 10, '98).

Therapeutics. — As already stated, antipyrine is especially useful in reducing very high temperature when unassociated with weak heart. For this reason it is valuable in the typhoid fever of children. It not only causes the

desired reduction in temperature, but also has a happy effect in calming the restlessness and distress caused by the action of the toxins upon the nervous system. In the pneumonia of children it has been found to be equally valuable, and it is a desirable remedy in the fever accompanying the exanthemata (measles, scarlatina, etc.).

In healthy children antipyrine is the most active drug in causing perspiration: next in activity is phenacetin; sodium salicylate and quinine show scarcely any influence whatever; acetanilid causes a diminution. In febrile children acetanilid increases the perspiration most; antipyrine not to the same degree; while sodium salicylate, quinine, and phenacetin cause suppression of the secretion. Ssokolow (Wratsch, Nos. 14, 16, 21, '93).

In influenza it not only controls the febrile movements, but relieves the pain and quiets the nervous system, but its depressing effects are sometimes harmful. In the hectic fever of tuberculosis it will sometimes be useful; but, as it influences the extension of the disease but slightly, if at all, and causes profuse diaphoresis and depression, other remedies are to be preferred.

Nervous Disorders.—It is in the treatment of neuralgia that antipyrine finds its best place. In hemicrania, sciatica, lumbago, the fulgurant pains of locomotor ataxy, the neuralgic pains of dysmenorrhœa when of ovarian origin, and in pains of nervous origin generally, antipyrine will be found of great value, being both efficient and prompt in its action. Small doses, from 5 to 10 grains every four hours are generally efficient. If ineffectual, the dose should be increased with caution, or the interval between the doses be shortened. In spasmodic conditions referable to the nervous system, bronchial asthma, laryngismus stridulus, pseudo-angina (not in true angina), and idiopathic epilepsy the following combination has been recommended by H. C. Wood:—

℞ Antipyrine, 6 grains.
Ammonium bromide, 20 grains.—M.

To be administered three times a day.

Forty-three cases of idiopathic epilepsy, in which the most excellent results were obtained by a combination of antipyrine and bromide of ammonium, as first suggested by H. C. Wood. The combination did not fail to give relief in a single one of the cases reported, and neither bromism nor the disagreeable effects often produced by antipyrine were observed. The dose employed in adults was 6 grains of antipyrine and 20 grains of bromide of ammonium three times a day. Charles S. Potts (Univ. Med. Mag., No. 1, '90).

Tried in an obstinate case of puerperal coccygodynia of two years' duration in which extirpation of the coccyx was seriously contemplated. Immediately after the first injection of a Pravaz syringeful the pain markedly decreased, while after a third it disappeared altogether and never recurred. Goenner (Corresp. f. Schweizer Aerzte, Jan. 25, '95).

[Antipyrine in 15-grain doses is probably the best of all drugs in systematic dysmenorrhœa, especially if accompanied by headache. E. E. Montgomery, Assoc. Ed., Annual, '94.]

Beneficial effects in forty out of sixty cases, but in three-fifths of these cases the affection recurred. One-half to 1½ drachms well tolerated for some weeks. Leroux (Revue Men. des Mal. de l'Enfance, June, '91).

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Case of exophthalmic goitre with peculiar eye-symptoms. Under antipyrine treatment retraction of the upper lid (Stellwag's symptom) disappeared, while failure of lid to descend upon downward movement of the eye (Graefe's symptom) remained unchanged. J. Hinshelwood (Brit. Med. Jour., Aug. 20, '98).

Antipyrine is essentially a nervine, and acts as an analgesic and antispasmodic. In pertussis, therefore, it is plainly indicated. By diminishing the irritability of the superior laryngeal nerve, which, by reflex, produces the cough, it arrests the attacks of coughing and prevents secondary symptoms. This action on the nervous element of the cough is the least disputed of the effects of antipyrine in pertussis. Of eighteen patients seen by le Goff, in seventeen the number of attacks and their intensity diminished considerably, and in nine recovery occurred in less than twenty-five days, thus considerably reducing the duration of the disease. Antipyrine being an antiseptic, the infectious principle of the disease is also reached.

Fifteen cases treated with antipyrine with marked success, the drug proving inefficient in only one instance. In some cases the effects were really astonishing; this was especially the fact when treatment was commenced in the early stages, at a time when medication is generally useless. In many instances the disease appeared to be aborted, and in others it was rendered so mild as to be insignificant. J. P. C. Griffith (Ther. Gaz., Feb. 15, '88).

The administration of antipyrine is the most satisfactory method of treating whooping-cough. Muttler (Jour. Amer. Med. Assoc., Aug. 15, '91).

Antipyrine is the best remedy as yet discovered for the treatment of whooping-cough. It may be given to a child of 10 or 12 years, in 2-grain doses every three hours until the effect is obtained, and then every four or five hours. The effect of the drug must be watched carefully, stopping it on the appearance of any cyanosis of the face or finger-nails. The cyanosis first appears under the thumb-nail, as it does when using antifebrin. It must be stopped when it causes profuse sweating. Hare (Med. and Surg. Reporter, Jan. 10, '91).

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Antipyrine employed in 300 cases of pertussis in which 196 patients were cured or benefited. The average duration of the treatment was thirty-five days. From 5 to 15 grains for children up to 3 years of age, and from 30 to 60 grains for older children and adults. The only symptom observed to follow the use of antipyrine is albuminuria, which appeared in two cases; it disappeared, however, rapidly after the cessation of the use of the drug and the establishment of a milk diet. Le Goff (Gaz. Heb. de. Méd. et de Chir., Oct. 22, '96).

In mental diseases antipyrine is contra-indicated, its depressing influence upon the nervous system tending to aggravate the pathological process.

It sometimes prevents hallucinations and other sensory disturbances of reflex origin. In most cases, however, no effect is produced or the symptoms are aggravated. Marandon de Montyel (Bull. Gén. de Thér., Apr. 30, '93).

Antipyrine in doses of 15 grains renewed in two hours recommended to produce sleep. One to 1½ drachms frequently given per day for a fortnight at a time, without ill effects. J. B. Tuke (Edin. Med. Jour., Feb.-June, '94).

Rheumatism.—In the treatment of rheumatism and gout antipyrine holds a well-recognized position of merit, relieving the acute pains incident to those affections and controlling the fever as well. It is, however, less desirable than the salicylates in rheumatism or colchicum in gout, and, moreover, is not devoid of serious danger if there be any lesion of the heart or blood-vessels.

In cases of acute rheumatism in children, the drug found to act readily upon the disease, but somewhat less promptly than salicylate of soda. Demme (Jahrb. f. Kinder. u. Phys. Erziehung, B. 27, H. 4, '88).

It often seems to act specifically in acute and subacute rheumatism, after

salicylic acid has failed. R. Hirsch (Ther. Monat., Oct., '88).

Case in which the temperature twice rose to 106° F., and was reduced by 10-grain doses of antipyrine. A. E. Godfrey (Brit. Med. Jour., Nov. 4, '93).

Antipyrine used subcutaneously: 15 minims to 30 minims, followed by massage at the point of injection, used in 130 cases of lumbago; 122 cured. The syringe should be carefully cleansed after use, as the antipyrine will ruin the instrument if allowed to remain. Excruciating pain is produced, but it continues but half a minute. Bergquist (Eira, vol. xiv, No. 3, '95).

DIABETES.—Antipyrine has been recommended in the treatment of this affection, but its merits as regards the permanency of results have not been sustained by the experience of clinicians at large. Its continued use is likely to give rise to untoward symptoms.

It is valuable in diabetes, the glycosuria and other symptoms promptly and markedly diminishing under the use of the drug. Pousson (Jour. de Méd. de Bordeaux, Oct. 11, '91).

While the favorable influence exercised is not to be doubted, the gastric intolerance manifested by a number of cases prevented its continuance. Vergely (Jour. de Méd. de Bordeaux, Oct. 13, '91).

Antipyrine, in doses of from 5 to 7½ grains, must not be continued more than eight to ten days. J. Mayer (Centralb. f. d. Gesammte Ther., July, '92).

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ANTITOXINS. See DIPHTHERIA, TUBERCULOSIS, and other diseases in which they are used.

APHASIA.—From Gr., α, priv., and $\phi\eta\mu\grave{\iota}$ or $\phi\acute{\alpha}\omega$, I speak.

Synonyms.—Aphrosia; alalia.

Definition.—A partial or total loss of the power of expressing one's self in speech or of understanding speech, which is dependent upon cerebral disorder.

Varieties.—There are two chief divisions of the affection: motor, or emissive or projective, aphasia and sensory, or receptive or subjective, aphasia. Each of these varieties includes at least two elementary forms: aphemia and agraphia, as motor subdivisions, and visual aphasia, or word-blindness (alexia), and auditory aphasia, or word-deafness, as subvarieties of sensory aphasia. The motor aphasia may be complete (aphemia) or there may be only some partial defect in the emissive mechanism of speech (dyslexia, paralexia, articulative ataxia, paraphasia, paralalia). The agraphia may likewise be complete (agraphia) or partial (paragraphia, dysgraphia). Pantomimic speech, so-called, which is an emissive form of speech in gestures, signs, etc., may be affected totally (amimia) or partially (paramimia) also. The more elaborate subdivisions of sensory aphasia are based upon qualitative rather than quantitative impairment. In the older literature all forms of sensory aphasia were referred to collectively under the term "amnesic aphasia," which included loss of the pictorial memory of letters and words and of the sounds of letters, words, and music. It included, also, loss of the power of understanding the meaning of figures, written music, and other symbols. In the more recent literature of the subject the term "amnesic aphasia" has been rather arbitrarily restricted to a loss of the naming rather than the ideational functions of speech-memory. Loss of the ideational faculty is expressed by the term "apraxia" (mind- or soul- blindness). Both sensory and motor aphasia may be divided, as regards the anatomical basis, into the cor-

tical and subcortical varieties. The terms "conceptional" and "conductive" are practically of identical significance with the terms "cortical" and "subcortical."

Symptoms.—Motor Aphasia (Aphemia).—In motor aphasia the voluntary act which must be carried out to give expression to thought by the phonetic co-ordination of the muscles of the larynx, tongue, soft palate, and lips is not performed. The patient is seldom unable to produce sound, but he can no longer produce an articulate sound. Although he understands what is said and can think, he is unable to give expression to his thought; it may be possible for him to pronounce letters or even meaningless words,—he may even retain some words,—but these are usually interjections of some kind. In some cases, nouns only or verbs only are forgotten. One language may be forgotten and another remembered. This variety of aphasia is usually encountered in persons who are affected with right hemiplegia. In some, however, who are left-handed, there may be left hemiplegia. In some cases, although speech is impossible, the patient can articulate in singing, especially if certain well-known airs are sung, the words in that case having become intimately connected with the notes.

Case of total aphasia of articulation in which the patient was able to intone the voice intelligently, as one does in speech. No agraphia; words readily understood. Brissaud (La Semaine Méd., Aug. 1, '94).

Case of aphasia in a child which, though unable to utter a single word as regards spontaneous speech, could articulate in singing. Knoblauch (Jour. of Nerv. and Mental Dis., June, '92).

Case of perversion of musical sense in which, with progressive movement in the (motor) aphasia, there remained a very imperfect musical expression, both with the violin and with voice. Kast (Neurol. Centralb., July 15, '88).

Case where a bullet in the cranial cavity caused intense pain, referred to the left occipital region with aphasia and a perversion of special sense impressions constituting a sort of allochiria, affecting smell, hearing, and common sensation. For example, when asked if a tuning-fork were heard, the patient would reply: "Yes, I see it." All impressions thus were referred to the centres of apparent vision. No word-blindness, word-deafness, nor agraphia; judgment and general mental condition apparently perfectly clear. Laplace (Jour. of Nerv. and Mental Dis., Mar., '93).

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Case in which a 40-year-old patient had suffered from attacks of hemicrania since the 16th year, which for two years had been complicated by motor aphasia. As, however, speech was disturbed between the attacks, the pupils were unequal, the optic reflexes increased, and patches of anæsthesia and Romburg's sign present, the case might well have been one of progressive general paralysis. Determann (Schmidt's Jahrbucher, B. 250, p. 130, '96).

Case of traumatic aphasia dependent upon sun-stroke. Three attacks have occurred in which the patient became unconscious, and was paralyzed in the right arm, leg, and lower part of the face. While recovering consciousness he began to speak in Norwegian, a language that he had not used for many years. Later his language was a conglomeration of English and Norwegian. Eventually he recovered completely. E. Mackey (Brit. Med. Jour., Dec. 10, '98).

Agraphia.—Agraphia consists in the loss of the memory of the necessary movements to write. In an uncomplicated case the patient is able to speak, hear, or read as usual, but when he tries to write he finds that he can no longer do so, though he is capable of copying letters or designs placed before him.

Pure agraphia is uncommon. It is usually associated with some degree of aphemia.

Agraphia can only occur in those persons whose education is sufficiently advanced to enable them to write automatically.

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In a thesis written under the direction of Déjerine the following conclusions reached:—

The centres of the images of language (motor centres for articulation and visual and auditory centres) are grouped in the convolution about the fissure of Sylvius, forming the zone of language.

Any lesion of this zone gives rise to an alteration in the interior language and consequently to manifest or latent alterations throughout all the modalities of language (speech, hearing, writing) with special predominance over the function of the directly destroyed images. Agraphia is always present. These form the class of true aphasias.

The class of pure aphasias (motor, subcortical aphasia, pure word-blindness of Déjerine, pure word-blindness) are located outside the zone of language and leave untouched the inner language. They never cause agraphia and affect only one of the modalities of language. They form a group apart from the true aphasias.

Nothing would tend to show the existence of a motor centre for graphic images. Both clinical observation and pathological anatomy agree as to its absence.

The existence of pure agraphia has not yet been established. Mirallié (Revue des Sci. Méd. en France et à l'Etranger, July 15, '96).

Amimia.—Sign-language, as practiced by deaf-mutes in gestures and pantomimic speech generally, may be affected by a cerebral lesion. Loss of pantomimic speech is often co-existent with aphemia or agraphia or both. It is rarely or ever found alone, although it is quite possible to conceive of its separate existence in one in whom this faculty had been especially cultivated. (Mills.)

Sensory Aphasia.—*Auditory Aphasia.*—This variety is more rarely met with than motor aphasia. Both the reception and production of audible speech are deficient, the leading symptoms being, on the receptive side, word-deafness and, on the productive side, word-amnesia and articulative amnesia.

Speech and separate words are distinctly heard by the subject, but no meaning is attached to them. Sounds, however,—such as that of an engine-whistle, an alarm-clock, the hour,—are heard and recognized. Right hemiplegia and a certain amount of word-blindness are frequently present. Certain cases of auditory aphasia hear as if spoken to in a foreign tongue, but they cannot understand what is said, although they endeavor to do so. Other patients understand neither what is said to them nor what they themselves say, but can repeat words after another. They repeat like parrots (echolalia) what is said; but, if the centre of articulate voice is still partially connected with the sensory centres of audition and the latter are normal, the repetition of the word may suddenly give rise, in their mind, to the idea conveyed by the word. Instead of articulate speech the phenomena may show themselves in connection with music or numbers. In subcortical word-deafness the patient hears, but does not understand. He can, however, repeat at once whatever he hears, and write it down. While writing or speaking he may understand the words used, but not after the mechanical act is accomplished.

Case of total word-deafness, without motor involvement of speech, the result of an apoplectic attack. Alexia present, but no hemianopsia or other defect of speech. E. A. Reynolds (Brit. Med. Jour., Nov. 28, '91).

Case of woman, aged 72 years, who had been deaf since childhood, and remained so until within six weeks of an apoplectic attack. Hearing during this period of six weeks had returned and remained. After the apoplexy she was found to be absolutely word-deaf. There were also motor aphasia and agraphia, with word-blindness. Shaw (Brit. Med. Jour., Feb. 27, '92).

[This case presents several features of interest, among which may be noticed the return of hearing six weeks before the last stroke, to disappear again on its supervention; the remarkable picking out by the lesions of the several cortical areas, which by various observers have been associated with the faculty of language corresponding with the clinical phenomena recorded,—the second frontal convolution with the agraphia, the third frontal with the aphasia, the angular gyrus with the word-blindness, the temporo-sphenoidal with the word-deafness and general deafness,—and the apparent recognition by the patient of the total failure to make herself understood, this last feature being somewhat noteworthy in view of the extensive nature of the cortical lesion. L. C. Gray and W. B. Pritchard, Assoc. Eds., Annual, '93.]

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Medico-legal conclusions drawn from a consideration of aphasia:—

1. Organic diseases of the brain may render a patient incapable of making a will, and that some form of aphasia may be produced also as one of the symptoms of the organic disease.

2. Some forms of aphasia may render a patient incapable of will-making.

3. Auditory aphasia, if at all well marked, incapacitates a patient from will-making.

4. Some other forms of aphasia, such as pictorial word-blindness, pictorial motor aphasia, and graphic aphasia, may render a patient incapable of making a will, not necessarily from being mentally incapable, but from the difficulty of carrying out the legal formalities.

5. These difficulties in carrying out the legal formalities necessarily vary according to the law of the particular country.

6. Simple uncomplicated cases of infrapictorial auditory, infrapictorial visual, and infrapictorial motor aphasia are capable of valid will-making. William Elder (Brit. Med. Jour., Sept. 3, '98).

Word-blindness (*Alexia*).—The patient sees written or printed letters and words and may be able to distinguish one from another, but they no longer have any meaning for him. Word-blindness is rarely total, however, a few words or letters being usually understood, nor is the disorder often found existing alone. In nearly every case there co-exists either word-deafness or motor aphasia or some other complication of speech.

Word-blindness is often found in connection with right lateral hemianopsia, or concentric diminution of the field of vision. The patient can no longer read, but can write; as he cannot read what he has written the letters and lines are sometimes uneven and resemble those written with the eyes shut. In the right hemianopsia found in this connection the written lines always begin on the left side of the page. The visual memory of numbers may be preserved or may also be lost (*cæcitas numeralis*). Word-blindness can, therefore, be divided into two categories: in the one, the sense of the letter itself is lost (*cæcitas literatis*); as a consequence, persons who generally read slowly, and spell out each word, suffer the total loss of the power of reading. In the other, the accompanying hemianopsia prevents the general physiognomy of a word being rapidly taken in by the patient (*cæcitas verbalis*).

Subcortical Word-blindness.—In subcortical alexia the patient can read or copy, but he does not understand what he does until the movement of his hand awakens in his mind the sense of

word-hearing and of motor articulation through the muscular sense.

> Additional form of visual defect in which there is not only word-blindness, but also failure to recognize the individual letters of which words are composed. Hinselwood (Lancet, Dec. 21, '95).
>
> Case occurring in an aged clergyman after a rather severe attack of vertigo with subsequent strong convulsive seizures. Absolute inability to interpret meaning of printed or written words by means of a retinal perception. Individual letters recognized; letter S provoked a disagreeable sensation when seen. Burnett (Archives of Oph., Jan., '90).
>
> Case in which single letters and short words could be pronounced in reading, but not long words, the patient forgetting first letters so quickly that they could not be combined. This case is considered as confirming Grashey's opinion that under all circumstances we read by spelling. Leube (Centralb. f. klin. Med., No. 115, '91).

In pure verbal blindness the meaning of the words may be lost, but, by following with the eye the form of the letters, the patient finally may spell out the word.

> Case of pure word-blindness in an insane professional musician. Left homonymous hemianopsia. Speech normal in articulation; ability to hear and understand, to spell verbally, and to write well under dictation, but inability to read his own writing, even the name. Total note-blindness, but ability to play from memory the most difficult pieces. Occipital lobes on both sides extensively diseased. Haisholt (Occidental Med. Times, Sept., '93).

Apraxia. — In apraxia (Kussmaul) the patient no longer recognizes the use of objects which he sees; a fork to him conveys no meaning of its use. Apraxia may affect other senses besides that of sight,—as, for example, hearing, taste, smell, etc.,—the sound of a bell may no longer convey a meaning or the taste of a dish.

Diagnosis.—In all cases of actual or suspected aphasia the patient should be examined as to his ability: 1. (*a*) To speak voluntarily; (*b*) to speak clearly and distinctly, pronouncing properly; (*c*) to repeat words dictated aloud. 2. (*a*) To write voluntarily letters, words, numerals, and sentences; (*b*) to write from dictation; (*c*) to copy; (*d*) to understand what he has written. 3. (*a*) To understand words and sentences spoken; (*b*) to understand or recognize vocal and instrumental music; (*c*) to understand the use of objects named. 4. (*a*) To read words, letters, numerals, and musical symbols if previously familiar with them; (*b*) to call objects by their names; (*c*) to recognize the use of objects exhibited; (*d*) to read and comprehend what is read. 5. (*a*) To name and recognize the use of objects felt, tasted, or smelt.

Word-deafness must be distinguished from deafness. If the patient does not suffer from aphemia, it will be at once perceived, from his ability to hear simple meaningless sounds, that he is not simply deaf. When word-deafness exists in combination with aphemia and word-blindness (this latter complication is uncommon) the diagnosis must be made between true word-deafness and apparent deafness with dumbness in a non-hemiplegic, demented subject.

If, however, the symptoms have followed an apoplectic stroke with right hemiplegia, the affection is probably word-deafness due to a cortical lesion.

Word-blindness, if isolated, is easily recognized.

Aphasia, or Aphemia. — Aphasia should be diagnosticated from (1) mutism due to melancholia; (2) mutism due to hysteria; (3) the silence observed

in hemiplegic patients who speak with difficulty; (4) the silence observed in hemiplegic patients who are suffering from pseudobulbar paralysis of cerebral origin; (5) word-blindness associated with word-deafness. All these present individual characters which must be studied in connection with the general symptomatology of each affection.

Agraphia arising from a lesion of the centre of writing should be distinguished from (1) the inability to write due to hemiplegia and (2) the agraphia due to a lesion of the visual centre in patients of limited education and who copy visual images; (3) the agraphia due to a lesion of the auditory centre, in which the patient writes only what is mentally heard by him.

The co-existence of word-blindness or of word-deafness with agraphia should suggest that the latter might be due to a lesion of the sensory centres (visual or auditory), especially if the patient did not previously write automatically, for agraphia due to a pure lesion can arise only in cases in which automatic writing has caused the development of a special graphic centre.

Infracortical Motor Aphasia.—A pure motor aphasia without word-blindness or word-deafness is likely to be of infracortical origin. Cases, however, have been reported in which an infracortical lesion has caused aphasia, word-blindness, and word-deafness.

Etiology. — The various varieties of aphasia occur almost always as a manifestation of cerebral lesion. The most common factor is softening; next in frequency are cerebral tumors and, especially, syphilitic lesions (Fournier), cerebral hæmorrhage, traumatisms, and meningo-encephalitis.

Aphasia may present itself during enteric fever, small-pox, and puerperal fever. Transient aphasia—following epileptic or hysterical convulsions, migraine, or concussion of the brain—has been occasionally observed, and certain degrees of the affection may be temporarily present and even recurrent in states of profound anæmia of the cerebrum.

Case of mixed aphasia with right hemiplegia due to meningo-encephalitis from cysticercus, affecting principally the anterior extremity of the sphenoidal lobe. Bitot (Jour. de Méd. de Bordeaux, Dec. 15, '89).

Two cases dependent upon tubercular meningitis. Picot (Gaz. Heb. des Sci. Méd. de Bordeaux, Mar. 16, Apr. 13, 27, May 11, '90).

Several cases of ataxic aphasia during pneumonia. In every case there was paresis and weakness of the right face and right arm. Cause supposed to be pneumococcus toxins. Chantemesse (Med. Record, Feb. 3, '95).

Four cases occurring during puerperal period, sixteen from literature; sometimes hysterical; in others, uræmic. In nearly one-half of the cases, aphasia is associated with right hemiplegia and due to embolism or thrombosis. Having occurred in one pregnancy, it is liable to occur in the next, and usually appears about one week after delivery. Cowe (Archives de Tocol. et de Gyn., vol. xx, No. 7, '94).

Case occurring as result of wound in left side of skull 9 centimetres from horizontal circumference, passing by superior border of auditory meatus and supra-orbital margins, 7 centimetres from sagittal suture perpendicularly, 1½ centimetres in front of left auditory canal. Spherical fragment separated and pressed down 1 centimetre into the wound. As soon as removed, speech became normal. Dorrenberg (Berliner klin. Woch., No. 18, '95).

Case of mixed motor and sensory aphasia consequent on influenza. Recovery after several weeks. T. D. Poole (Edinburgh Med. Jour., Aug., '90).

Case of motor aphasia with graphia and dyslexia in conjunction with attacks

of *petit mal*. Eye-strain. Improvement from properly adjusted glasses. Muehleck (Univ. Med. Mag., June, '91).

Case in girl, aged 10, due to embolism. Suckling (British Med. Jour., May 21, '92).

Case with right facial paralysis and right Jacksonian epilepsy due to injury over base of right parietal. Recovery in few weeks. Symptoms supposed to be due to contusion of left centres, from counter-stroke. Ransohoff (Cincinnati Lancet-Clinic, Apr. 16, '92).

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Case of a woman, aged 20 years, who was infected, after her marriage, with gonorrhœa, and who was attacked with severe convulsive movements in the right side of the face and tongue and in the right forearm. The following morning there were present right hemiplegia and complete motor aphasia. Sensitiveness was preserved. The hemiplegia persisted and typical contracture occurring, but the paralysis of the facial and pharyngeal muscles improved. The aphasia improved slowly. After six months it was found that understanding of words was completely restored, that both writing and print could be read, only some mutilation of words remained after a certain time. Repetition of words was perfect. The left hand could be used to write grammatically with good orthography. Since the patient suffered from salpingitis due to gonorrhœa, the troubles described are undoubtedly due to a thrombosis. L. Bruns (Schmidt's Jahrbucher, B. 250, p. 236, '96).

In polyglottic patients suffering from aphasia the disturbances in speech do not always affect to the same degree all the languages spoken by the patients.

When recovery occurs, it does so usually systematically and progressively; the language that first returns is usually the one first learned. The patient begins by understanding before being able to speak. At times, however, there occurs an arrest in the process of recovery: the patient in such a case recovers only the ability to understand and then to speak the language usually spoken by him, or he may understand one or several languages, but be unable to speak them.

In such cases it is evident that there is no destruction of the cortical centres of speech, but only of shock to their elements. The varying intensity of such shock explains the gradation of the symptoms noted in the patients seen by the writer.

Consequently it is not, in general, necessary to claim the existence of multiple centres of speech, each one peculiar to one of the languages successfully learned by patients speaking several languages. The paper is based on seven observations. A. Pitres (Rev. de Méd., Nov., '95; Revue des Sci. Méd., '96).

Case in which the patient, who had been under almost continuous observation for eighteen years, was almost completely aphasic. At the autopsy Broca's convolution was found to be intact. Bastian (Lancet, Dec. 19, '96).

Case of motor aphasia at the beginning of scarlatina, in a girl aged 3½ years. The aphasia appeared on the fourth or fifth day of the eruption; this differs from the usual time of appearance, which is late,—*i.e.*, about the time of appearance of renal symptoms, it being a symptom of uræmia. The speech-disturbance disappeared after fifteen days. Brasch (Berliner klin. Woch., No. 2, S. 30, '97).

Case in which the symptoms were word-deafness, verbal amnesia, jargon paraphasia, paralexia, loss of comprehension of print, and agraphia, with retention of ability to copy Roman letters into script and with no visual defect whatever. The impairment of all ways of using language, so often observed as a result of auditory lesion, due to the fact that the auditory centre is normally active in spontaneous speech, reading, and writing, as well as in the comprehension of speech. H. T. Pershing (Boston Med. and Surg. Jour., Sept. 23, '97).

Case of aphasia with frequent attacks of word-deafness and spasm of the right side of the tongue and face. At autopsy tumor was found in the lower part of the Rolandic fissure resting upon the first

temporal convolution. Philip Zenner (N. Y. Med. Jour., Jan. 8, '98).

Pathology.—Motor Aphasia.—Pure aphasia of articulation is due to a lesion of the foot of the third left frontal convolution (Broca's convolution). If the lesion affects more than this region, other symptoms are present. If the lesion occupy but a portion of the region, the aphasia may be partial only,—for instance, nouns only will be missing. In persons habitually left-handed a lesion of the third right frontal convolution may produce motor aphasia. In persons who are ambidextrous the aphasia is of slighter degree and is more transient. The lesion may be either cortical or subcortical. As a rule, in the subcortical cases the defect is rarely complete.

Case of motor aphasia (partial) with agraphia (complete), alexia (partial), and occasionally auditory aphasia. Right hemiplegia. Vast focus of softening in the left hemisphere. Motor aphasia explained by destruction of the third left frontal; motor agraphia by destruction of white matter connecting inferior parietal with second left frontal; partial auditory aphasia by destructive lesion involving first temporal lobe. Incomplete alexia due to destruction of inferior parietal lobe. Bernheim (Revue de Méd., May 10, '91).

Sole well-demonstrated anatomical localization is that of the foot of the left frontal convolution. Bernheim (Le Bull. Méd., Oct., '94).

Case in 4-year-old child. At the autopsy several tubercular nodules were found in brain, one being at the base of the left third frontal gyrus. Mosny (Bull de la Soc. Anat., Mar., '88).

Case with right hemiplegia, with temporary conjugate deviation of the eyes, excited by attempts to converge the eyes strongly toward the middle line. The autopsy proved this to be due to irritative implication, without destruction of the region shown experimentally by Ferrier, Horsley, Beevor, Shafer, and Mott to be related as a centre to these movements. Delépine (Brit. Med. Jour., Sept. 10, '92).

Case of complete motor aphasia consequent on fall. Ability to use right hand to write; left hemiplegia. At autopsy left hemisphere found normal; right hemisphere injured. The man had never been left-handed. Luys (La Semaine Méd., Mar. 19, '91).

Motor speech-centre capable of further subdivision into subareas representing various perversions of functions which are in relation, through isolated lesions, to the subtypes of motor aphasia, including the ataxic and amnesic, the agraphic and others. Wylie (Archives Clin. de Bordeaux, Oct., '93, to May, '94).

Case of syphilitic apoplexy, right hemiplegia, motor aphasia, and word-blindness without blindness for words or objects. Visual field showed no contraction or hemianopsia. Lannois (Le Bull. Méd., Sept., '95).

Case of pure motor aphasia, with ability to read and write down thought fluently with the left hand, due to extensive softening, principally affecting the left frontal convolutions, extending deeply, even to the internal capsule in the white substance.

Case in accord with the statement that ability to understand words might be retained, with complete involvement of the frontal convolutions, and that agraphia does not, as claimed by some, belong to Broca's aphasia. Kostenitsch (Centralb. f. klin. Méd., Mar. 31, '94).

Disturbances in fifteen cases of cortical motor aphasia due to destruction of Broca's convolution, correspond exactly to the description given by Trousseau. Patients read as badly as they write. It is incorrect to maintain that they preserve ability to read mentally. Déjerine (Le Bull. Méd., July 10, '95).

Case of Jacksonian epilepsy accompanied by motor aphasia without agraphia, conclusively proving that the former may exist without the latter. There is too great a tendency to regard language as a special and isolated phenomenon among manifestations of nervous centres. Prévost (Revue Méd. de la Suisse Rom., June, '95).

Case, lasting ten years, with distinctly

causative subcortical lesion. Horizontal section through Broca's convolution showed, at its base, an old focus of softening, 1 centimetre in diameter and 2 centimetres from the cortex; 1 centimetre farther back was a second focus. A section 1 centimetre above the first showed an ancient, grayish focus in the white substance, on a level with the anterior half of the base of the third frontal, independent of the other two and on a plane anterior to them.

Second case, with centre of softening in the white substance to the third frontal, prolonged, on a level with the inferior extremity of the Rolandic fissure, into the foot of the ascending frontal convolution. Déjerine (La Semaine Méd., Mar. 4, '91).

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Case of motor aphasia following influenza which occurred in a previously-

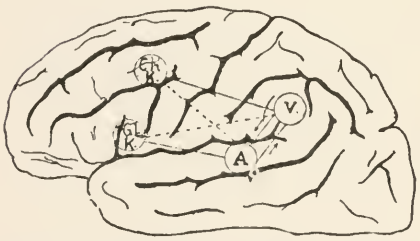


Diagram showing the approximate sites of the four word-centres and their commissures. (*Bastian.*)

healthy woman. There were likewise present paresis of the right arm, and paralysis of the left vocal cord. Sensation was somewhat diminished on the right side of the face and in the right arm. The patient could neither speak, repeat, nor write a single word, but could understand everything and read both written and printed words. The symptoms were traced to two lesions: 1. To ulcerative laryngitis with peripheral paralysis of that branch of the inferior laryngeal nerve which supplies the posterior crico-arytenoid muscle. 2. To cerebral hæmorrhage which caused the aphasia and the paralysis of the face and arm. Kohan and Stembo (Schmidt's Jahrbucher, B. 250, H. 33, '96).

Case showing that associated movements of the arm and hand, which are observed in certain people when speaking, may be unusually prominent in pathological conditions of the speech-centres. R. Remak (Neurol. Centralb., Jan. 15, '97).

Case of a man who, since his childhood, had practiced the deaf-and-dumb language, employing his right hand almost exclusively. After the occurrence of a cerebral thrombosis, he was entirely unable to communicate with this hand, although the paresis was not great. With the left hand he still expressed himself without difficulty. Grasset (Med. News, Jan. 16, '97).

Case sustaining Pitres and Charcot's view that there must be a homologue of the motor speech-centres,—viz., a special graphic centre containing the memories of the motions required for the execution of written characters. Destruction of these memories causes inability to write in written characters, while writing with printed characters may be possible with the help of the visual letter- and word- memories. This centre of the graphic memories is, however, probably situated in close proximity to the arm-centre; possibly both may be contained within the same cortical area. B. Onuf (Jour. Nerv. and Mental Dis., Feb., Mar., '97).

There are four centres in the cerebral cortex which are concerned in the production of spoken and written language. Two of these, in the posterior parts of the cerebrum, correspond in position to the visual and (as far as is known) auditory centres, and are of the ordinary sensory type; the others, in the second and third frontal convolutions, respectively, are excitomotor centres for writing and speech. There is a system of commissures between the various centres, the value of which is exemplified by such actions as reading aloud and writing from dictation. When any particular channel is blocked, other commissures may take on the work. This is especially true of the callosal fibres connecting the

two hemispheres. Aphasia depends either upon damage to one or other of the four centres in the dominant hemisphere, or upon interruption of the commissures connecting them. Attention called to the considerable power of reciprocal substitution possessed by the visual and auditory word-centres for the production of speech and writing, respectively, and to the fact that in all probability both auditory word-centres—and not, as formerly believed, the left alone—are accustomed to act on Broca's centre in the production of speech. H. C. Bastian (Lancet, April 3, May 1, '97).

Advisability of enlarging the zone of language, as given by Déjerine, so as to make it include a centre for concepts in the third temporal convolution, and possibly extending over more of the mid-temporal region, and, in addition, a graphic motor centre in the caudal portion of the second frontal convolution. This zone of language unquestionably has its deepest organization and highest development in the region encircling the Sylvian fissure, for here is situated the auditory centre, out of which the others may be said to have been evolved, and the motor, articulatory, and visual centres which are next in importance, as they have been next in development; but it must also include those portions of the brain in which concepts originate, and, if the views of those who believe in separate graphic motor centres are correct, also those parts in which graphic motor images are represented. Chas. K. Mills (Medical News, June 5, '97).

Case of complete word-blindness; right-sided homonymous lateral hemianopsia; no agraphia, but inability to read own writing; optical aphasia; temporary mind-blindness; the ability to spell correctly completely retained.

Case of paralysis of the right hand and arm; aphasia; very marked word-blindness presenting the peculiarity that the patient could read many words (combinations of letters) while he was absolutely unable to recognize the individual letters of which they were composed, with some impairment of the motor side of the speech-mechanism; partial right-sided homonymous hemianopsia, with some peripheral constriction of the sound half of each field.

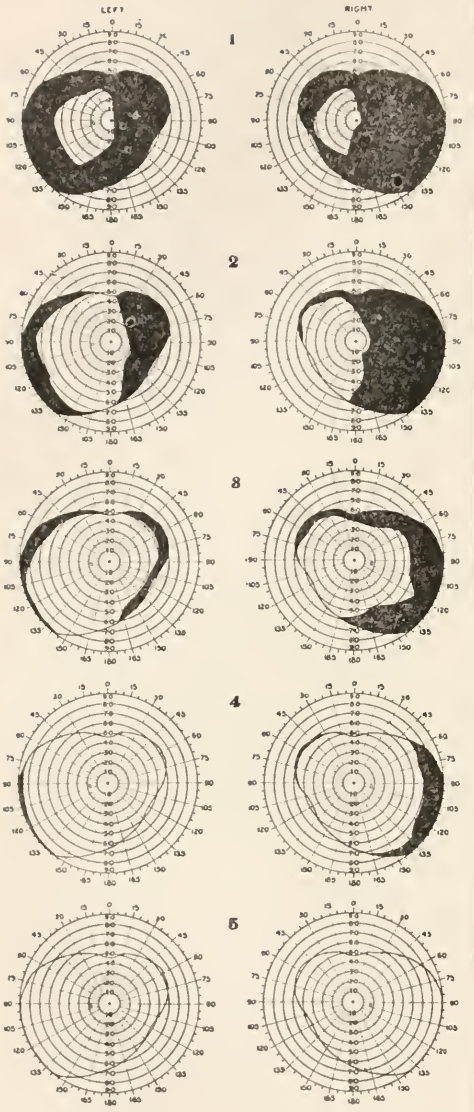
Case of word-blindness in a patient who had never learned to write; constriction of the fields of vision chiefly toward the right; no obvious word-deafness; cardiac and renal disease; death; extensive old softening in the white matter of the left occipital lobe and of the left angular gyrus, and the back part of the first temporo-sphenoidal convolution.

Case of word-blindness and agraphia; instead of reading individual letters as letters, the patient substituted a word commencing with the letter which he could not read—"George" for "G," "nearly" for "n," etc.

Case of sudden cerebral attack after confinement; absolute deafness to all sound for sixteen days; temporary motor aphasia and word-blindness; absolute word-deafness for four weeks; rapid recovery from the motor aphasia; partial recovery from the word-blindness; very slow and imperfect recovery from the word-deafness; slight paraphasia and slight paragraphia; echo speech; retention of the power of writing from dictation and of reading aloud; no hemianopsia; redevelopment of acute cerebral symptoms (meningitis or cerebritis) six months after the original attack; hyperpyrexia; death.

Sudden cerebral seizure due to embolic infarction in a man aged 25 years; temporary loss of power in the right side of face, right arm, and right leg; complete motor vocal aphasia; some—but, comparatively speaking, much less—agraphia; no word-deafness; no word-blindness; complete recovery of the power of writing; gradual, but slight, improvement as regards vocal speech; second embolic attack four months afterward; increased paralysis of the right side of the face, of the right arm, and of the right leg; no increase of the motor vocal aphasia; marked increase in the agraphia; some word-blindness; no word-deafness; death four years after the original seizure.

Seven out of twelve cases supporting the view that the right hemisphere must



Series of perimeter charts in a case of complete agraphia and almost complete word-blindness, with right-sided bilateral temporal hemianopsia. (The black area represents the blind parts of the fields.) Chart 1 represents the fields of vision on Nov. 17th. Chart 2 represents the fields of vision on Nov. 24th. Chart 3 represents the fields of vision on Dec. 1st. Chart 4 represents the fields of vision on Dec. 8th. Chart 5 represents the fields of vision on Dec. 15th. (*Byrom Bramwell.*)

be regarded as forming an active part of the nervous speech-mechanism; in other words, that the so-called speech-centres and speech-faculties are bilaterally represented. Byrom Bramwell (Lancet, Mar. 20, 27; April 10, 17; May 8, 22, '97).

AGRAPHIA.—True agraphia almost always occurs as a result of a lesion of the foot of the second left frontal convolution or of the subcortical fibres therefrom. Agraphia is generally found, however, associated with some form of motor aphasia, rarely existing alone.

Case of a woman, who, at 44, had an attack of right hemiplegia involving the tongue. She lost the ability to write spontaneously and from dictation, but could copy. There was no word-deafness nor word-blindness. When 55, a second attack of hemiplegia occurred, this time of the left side, with complete loss of speech. A third and fourth attack occurred six years later, and death eight years afterward, at the age of 69. At the necropsy areas of softening were found in the left hemisphere (1) at the posterior extremity of the second frontal and (2) in the middle portion of the second frontal on the right side; (3) at the anterior extremity of the third frontal and posterior portion of the third frontal, extending into the ascending frontal (4) at the foot of the ascending frontal and parietal and (5) in the posterior portion of the ascending parietal. Two additional areas of softening were found at the base of the right hemisphere, but these, with No. 3 were supposed to have given rise to no symptoms. Nos. 2 and 4 caused symptoms of bulbar paralysis, No. 5 the left hemiparesis, while No. 1—the lesion at the posterior portion of the second left frontal—was considered responsible for the peculiar form of agraphia. Charcot and Dubreuihl (Annual, '94).

The above or similar cases reported do not prove that the centre for written language lies in the second left frontal. It is very difficult to isolate and localize a pure motor agraphia. Against the hypothetical existence of a centre for

writing in the above case is the fact that no one could write with the feet as well as with the hands, although it can be conceived that a higher motor centre for writing may exist, connected with the lower centres for the hand and foot either of which may govern the peripheral mechanism of writing. The same type of agraphia had accompanied motor aphasia in this case, in cases in which the lesion was of Broca's convolution. Déjerine (Annual, '94).

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Case of a man of 26 who had been violently pushed, the head striking forcibly against edge of a dresser. Injury was over right parietal eminence. For two or three days afterward showed the ordinary symptoms of concussion. Later he could not recognize letters or figures, nor name most things at sight, though he could point out anything named, and, a name being suggested, he repudiated the wrong one on every occasion. Spontaneous writing was confined to his own name, which he wrote quickly. He could neither write from dictation nor read aloud. He could copy, but could not transfer printed into written, nor written into printed characters. The field of vision was normal in both eyes. No hemianopsia was present. Gradually the patient improved. Not until the man was able to read aloud was there any sign of understanding any written question. He could read aloud a few combinations of figures, such as 100 and 1897, and write 1897 down in well-formed figures, but he could not recognize individual figures at sight, nor put them down from dictation. This suggests the possibility of there being a distinct group of cells the function of which is to store combinations of figures which might be called the visual figure-combination-centre as distinct from the visual figure-centre. Four divisions of the visual nerve-centre might be made: (*a*) one for letters; (*b*) one for numerals; (*c*) one for words: (*d*) one for combinations of figures. One would naturally expect only two subdivisions: (*a*) a centre for letters and numerals: (*b*) a centre for words and figure-combinations. But Hinshelwood has noted that there are cases in which the visual memory for letters is entirely lost, while that for figures is intact, or in which the visual word-memory only was affected. C. MacVicar (Scottish Med. Jour., Nov., '98).

Sensory Aphasia.—Cortical word-deafness is usually caused by a lesion of the middle or posterior portion of the first and second left temporal convolution, chiefly the first. Auditory speech is not, however, so exclusively a left-brain function as is motor speech; hence the fact of incomplete and more transient types of speech-defect from unilateral lesions of this region. Lesions affecting the subcortical white fibres from this area give rise to the subcortical type of word-deafness, as it is termed.

Case of deaf-mutism, in an adult, due to symmetrical lesions in the two temporal lobes. The first and second temporal convolutions were replaced by cicatricial tissue; the third was atrophied and sclerosed. Seppili (Alienist and Neurologist, Apr., '95).

Case of lesion of the first, second, and third right temporal lobes, with word-deafness. Many similar cases are reported in literature; two cases of lesion of the left lobe in left-handed persons, without deafness, and thirty cases with word-deafness from lesions of the left temporal lobe in right-handed persons. Scavano (Revue Inter. de Bibliographie, June 10, '93).

Case of lesion of the left temporal lobe in a left-handed man without word-deafness. Seppili (Alienist and Neurologist, Apr., '93).

Literature of '96-'97-'98.

Three autopsies in patients with sensory aphasia. There were softening and atrophy of the left first temporal convolution. Case of subcortical aphasia noted. The patient could not speak and had no comprehension of spoken language. He had right hemiplegia. Softening of the external capsule and lenticular nucleus was found at autopsy. W. T.

Worcester (N. Y. Med. Jour., Jan. 8, '98).

Cortical word-blindness is caused by a lesion of the postero-inferior portion of the second left parietal convolution (angulo-occipital region).

Lesions affecting the optic radiations of Gratiolet cause the subcortical variety of alexia. Interruptions of relations through commissural fibres with any of the associated speech-areas will, of course, result in one of the mixed forms of aphasia or in subcortical alexia.

Case of pure word-blindness for letters, words, musical signs, with retained ability to read figures and calculate. No word-deafness nor difficulty in articulation nor any impairment of motor power or sensation. Four years later sudden seizure and death. For two days before death there were paraphasia and agraphia resulting from the seizure, which was found at the autopsy to have involved the left inferior parietal convolution and angular gyrus. Old yellowish areas of softening with atrophy found in the lingual and fusiform lobules, the cuneus, and the apex of the occipital lobe; secondary degeneration in the splenium of the corpus callosum; and pronounced atrophy in the optic radiations. The right hemisphere was intact. Histologically, lesion least pronounced at level of lower lip of calcarine fissure and especially localized in the fusiform and lingual lobules, the tapitum, and the radiations of Gratiolet, and the inferior longitudinal fasciculus of Burdach were entirely destroyed. All of the structures in the descending branch of the calcarine fissures were involved in the softening. Conclusion that the lower portion of the inferior longitudinal fasciculus of Burdach contains fibres that connect the visual centre with the centre for language. Déjerine and Vialet (Comptes Rendus Heb. des Séances et Mémoires de la Soc. de Biol., No. 28, p. 790, '93).

Case of word-blindness with agraphia, due to a spot of softening as large as a five-franc piece, occupying the whole of the inferior parietal lobe. Neither motor aphasia nor word-deafness was present. Sérieux (Bull. de la Soc. de Méd. Mentale de Belgique, Mar., '92).

Case of alexia, agraphia, amnesic aphasia, and word-deafness, due to tumor in the occipital lobe, having largely destroyed the subcortical commissural fibres in the angular gyrus. Weissenburg (Archives de Neurol., July, '92).

Review of the literature of sensory aphasia, and several cases. Conclusion that the essential central lesion which produces word-blindness is the angular gyrus, there being but little evidence tending to show that the supramarginal gyrus has anything to do with this phenomenon. Shaw (Brain, Winter, '93).

Fifty cases of sensory aphasia in which Broca's centre was not found diseased. In all some form of sensory aphasia was present, and in all the lesion lay in the lower posterior third of the brain. The convolutions were found affected in the following order: The first temporal in 38, the second temporal in 27, the inferior parietal in 21, the angular gyrus in 25, the supramarginal gyrus in 12, the occipital lobe in 12. Paraphasia may be caused by lesions in various locations. Word-deafness due to a lesion of the first and second temporal convolutions, and word-blindness may be produced by lesions lying in the region of the inferior parietal lobule, or extending over, anteriorly from it, into the temporal region, or, posteriorly, into the angular gyrus and occipital lobe. Failure to recognize a word heard implies destruction of the temporal cortical area; failure to recall the name of an object seen implies the destruction of the temporo-occipital association tract in the subcortical white matter.

If the lesion be extensive enough to involve the cuneus, or deep enough to reach the visual tract to the cuneus as it passes beneath the angular gyrus and convexity of the occipital lobe, it will produce hemianopsia; if not, actual blindness may not accompany psychical blindness. In either case it is found that when things are not recognized they cannot be named when seen. The visual

memory-pictures lie in the angular gyrus and inferior parietal lobule. M. Allen Starr (Brain, July, '89).

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Hemianopsia and word-blindness are not necessarily associated. The frequent association of word-blindness with hemianopsia is explained by the intimate relations existing between the supramarginal convolution and the bundle of optic radiations. In order to explain the absence of word-blindness in right lateral hemianopsia it is necessary to call attention to the intrahemispheric fibres of the corpus callosum; these latter are injured in subcortical alexia, or pure word-blindness. In order to obtain word-blindness without hemianopsia, there must be a lesion of the supramarginal convolution superficial enough to avoid injuring the underlying white fasciculi. Absence of hemianopsia in word-blindness or total aphasia affords a much more favorable prognosis. Joanny Roux (Revue des Sci. Méd. en France et à l'Etranger, Apr. 15, '96).

Prognosis.—Word-deafness may continue permanently, but it frequently improves through the co-operation of other sensory centres, and especially the visual centre. The patient, noting the movements of the lips in those who are speaking to him, recalls motor images which articulation of the same words would require in him.

Word-blindness does not improve in some cases; in others a painstaking and early re-education may be carried out by which new images may be created in the visual memory by the help of the motor and auditory memories.

Aphasia proper, or aphemia, occasionally remains the same from the beginning to the end, no improvement being visible; usually, however, words return very gradually. Recovery, in such cases, is never complete.

Some cases recover almost immediately. This almost always occurs in cases of complete aphasia, and would seem to be of dynamic origin, like the mutism of hysteria or of terrified persons.

If congenital aphasia is found in a child under three years, especially if it be rickety or hydrocephalic, the disorder may be due to a simple retardation of development; if the patient is more than three years old the prognosis must be very guarded. Herzen (Revue Méd. de la Suisse Rom., Nov. 20, '95).

Systematic recovery occurs in cases in which the centres of speech are shocked, but not destroyed, by cerebral lesions which cause aphasia, and which gradually resume their functional activity. A. Pitres (Revue de Méd., Nov. 10, '95).

In cortical motor aphasia the patient recovers the faculty of reading gradually in the following order: (1) appearance of the word; (2) association of syllables; (3) association of letters forming each syllable. Exact reverse of learning to read during childhood. Thomas and J. C. Roux (Le Bull. Méd., July 10, '95).

Case with agraphia, but without alexia, of eight years' standing. During an attack of anger a sudden pain was felt in the head, and this was followed by recovery of speech. Dobie (Lancet, Jan. 9, '92).

Agraphia is, in some cases, recovered from in the sense that the patient learns to write with the left hand. The writing does not resemble that performed with the right hand, and in some cases it is written from right to left, as in mirror-writing.

Three cases treated by practice in writing with the left hand; centromotor, marked improvement in a few months; centrosensory aphasia best treated by loud speech or singing. Gutzmann (Deutsche med. Zeit., Feb. 8, '94).

Supracortical motor aphasia is less serious than cortical motor aphasia, because the intelligence is less affected, the centre of language itself being intact and only the path of communication being interrupted.

Recovery occurs more frequently than in cortical motor aphasia.

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The prognosis depends on the site and nature of the lesion. Incurable lesions may preclude improvement even in the slighter cases of aphasia. Extensive progressive lesions are, of course, worse than circumscribed ones. Hæmorrhage, embolism, thrombosis, include the majority of cases of aphasia. If death does not occur, even the worst disturbances of speech may be recovered from; while, on the other hand, even slight affections of speech may persist throughout the remainder of life. Age is an important factor. Children may learn to speak again even after extensive damage to the speech-centres, whereas small lesions in old people may produce a lasting aphasia. The individual power of learning undoubtedly plays a part in the result. The longer the aphasia has lasted without any tendency to improvement, the worse the prognosis, and this is also the case where the intelligence steadily fails. Karl Bok (Festschr. des Stuttgart. Aerztl. Verein, '97).

Treatment.—When there is no paralysis present mental overwork is a frequent cause of aphasia. Prolonged rest alone secures relief. Any disorder, concomitant or causative, that may be present should receive careful attention. At the same time the patient should be taught to overcome the aphasic symptom; considerable patience is usually required. When the aphasia is associated with right-sided paralysis or convulsions, the treatment of the latter condition by alteratives, potassium iodide or mercury if a syphilitic taint be present, sometimes brings about rapid recovery.

Case combined with amimia, the result of a kick of a horse on left parietal bone. Six weeks later, on examination, the patient was found without fever, pulse normal, appetite good, eyes and ears normal, and no paralysis, except of the fingers of the right hand. Over left parietal bone were three ulcers, the lowest of which was two centimetres over the left ear. It was about three centimetres long, equally wide, bulged out, and showed distinct cerebral pulsation. The cranial vault was depressed about the ulcers. The depressed portions of bone were removed, the corresponding defect being covered with two flaps, after von Bergmann's plastic method. The paralysis of the hand disappeared rapidly, followed by complete restoration of speech on the twenty-second day. Rosenberger (Centralb. f. Chir., No. 25, '90).

Remarkably instructive case of nine years' standing. By educating the right hemisphere, within six weeks acquirement of a vocabulary of over one hundred words and several invaluable short sentences. Kuchler (Präger med. Woch., Oct. 18, '93).

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Case of uræmic aphasia. The patient, a man of 56, was suddenly seized with an apoplectic attack; he regained consciousness, but presented aphasia, monoplegia of the right arm, and a systolic murmur at the base of the heart. Some days later the patient was seized with a sudden attack of intense dyspnœa, with Cheyne-Stokes respiration; the urine was scant and very albuminous, and the blood contained seventy-five centigrammes of urea to the litre. The patient was bled immediately and recovered in two days, the monoplegia and the aphasia completely disappearing. Rendu (Gaz. Méd. de Paris, Apr. 4, '96).

Case of complete agraphia and almost complete word-blindness, with right-sided bilateral temporal hemianopsia, due to a lesion (gumma) in the region of the left angular gyrus, in which rapid and complete disappearance of all the symptoms took place under the administration of large doses of iodide of potassium. Byrom Bramwell (Lancet, Mar. 20, '97).

The treatment of amnesic aphasia lies in efforts to stimulate the defective recollection of words. The words must

be learned by heart, and then short reading exercises adopted. The exercises should be performed in front of a mirror, in order to restore the recollection of the necessary movements. In motor aphasia other parts of the brain may take on function. Single sounds, then syllables, and lastly words, are taught. Writing exercises with the left hand should be performed along with the articulation exercises. The patient should be taught to form words from printed letters. The treatment of sensory aphasia is more difficult. The first attempts are made by means of written language. Lip-reading should be developed, and reading, writing, and other exercises combined with it. The case may be much complicated by a combination of different forms of aphasia. Much patience is required. Karl Bok (Festschr. des Stuttgart. Aerztl. Verein, '97).

Injury to the skull, especially when there is depression of the inner plate, tumors, cerebral hæmorrhage, and other conditions capable of inducing cerebral pressure require appropriate surgical procedures.

Case combined with paraphasia greatly benefited by trephining. Fogliano (Gaz. deg. Osp., No. 4, '91).

Literature of '96-'97-'98.

Cases illustrating the value of operative measures:—

Case of mind- and word- deafness after repressed fracture of the skull with subcortical hæmorrhage; operation; complete recovery.

Case of glioma of the left centrum ovale, monoplegia, word-blindness, alexia, agraphia, partial apraxia, and color-blindness; operation; improvement.

Case of cyst of the brain in the foot of the left second frontal convolution; motor agraphia (?) from inability to spell; evacuation of the cyst; improvement; traumatic meningeal hæmorrhage two months later; second operation; recovery.

Case of oro-lingual paralysis and slight motor disturbance in writing of thrombotic origin; operation; recovery.

Case of motor and sensory aphasia of seven years' duration, due to probable thrombosis followed by angioma; operation; relief of pain; slight improvement in speech. J. T. Eskridge, Clayton Parkhill, and E. J. A. Rogers (Med. News, June 20; July 11; Aug. 1, 15; Sept. 5, '96).

Landon Carter Gray,
Wm. Broaddus Pritchard,
New York.

APIOL.—Obtained from the volatile oil of parsley, and at low temperatures, is a stearopten or camphoraceous solid made up of needle-like crystals; but at higher temperatures resolves itself into a yellow or straw-colored liquid. It has a slightly-acid reaction and is soluble in alcohol, ether, and chloroform. Most of the apiol of commerce is nothing but an oil of parsley, though the best has usually a percentage of the latter added in order to insure fluidity at all temperatures. It may be prepared in various ways, but the methods of manufacturers as published are usually obscure, and often open to severe criticism. So-called *green* apiol is the oil of parsley loaded with chlorophyll and vegetable fats. The *red* apiol that appears in the market, as well as the proprietary so-called "apioline," is merely the yellow apiol oxidized by means of sulphuric acid.

Dose.—Owing to unpleasant odor and acrid taste, apiol is best administered in gelatin capsules or perles, each holding from 3 to 5 grains. Two to four capsules may be taken daily, preferably night and morning, beginning two or three days before the expected menstrual flow.

Physiological Action.—Apiol is thought to mainly act upon the vascu-

lar system, causing congestion, and at the same time on the muscular tissue of the uterus. This view is based upon its action as an emmenagogue and by its effects upon the menstrual flow; yet it is also a regulator of uterine function.

Therapeutics.—According to Griffith and Cerna, apiol (apioline) may be regarded as the best emmenagogue at present known. It is indicated in amenorrhœa due to anæmia from whatever cause. W. A. Newman Dorland believes, however, that, in order to insure the best results, it should be combined with some preparation of iron; he also suggests that iron be given uninterruptedly until a few days before the expected appearance of the menses. Then, continuing the iron, apiol may be prescribed in 5-minim doses, two or three times a day, until the appearance of the menstrual discharge.

Apiol (apioline) strongly recommended for the relief of dysmenorrhœa and amenorrhœa. Hill (Virginia Med. Monthly, Apr., '91); Delmis (Le Prog. Méd., Apr. 25, '91).

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In the treatment of dysmenorrhœal cases, where there is no tangible pelvic lesion demanding strictly local attention, or operative interference, I have of late come to rely on a single remedy: apiol, the active principle of *Petroselinum sativum*. Three illustrative cases of the neurotic variety of dysmenorrhœa, demonstrating the marked value of the drug as a therapeutic agent, D. S. Maddox (Med. and Surg. Reporter, June 5, '97).

APOCODEINE. See Opium.

APOCYNUM CANNABINUM.—This is the root of the *Apocynum Cannabinum*, or Canadian hemp. The plant is gray or brownish gray in color, with rather thick bark and porous spongy wood. It contains, besides tannic acid, gallic acid, and gum resin, a bitter principle which is found in the market under the name of "apocynin." This is an amorphous resinous substance, not a glucoside, easily soluble in alcohol and ether, and almost insoluble in water.

Apocynum itself is inodorous, and has a disagreeable, bitter taste.

Dose.—The powdered root may be given in doses varying from 5 to 30 grains. In small doses it acts as a bitter tonic; in 10- to 15- grain doses it acts as a diaphoretic, diuretic, and laxative. In larger doses—15 to 30 grains—it very considerably irritates the gastro-intestinal tract and gives rise to vomiting and diarrhœa.

Dose of the decoction (1 drachm to 8 ounces), 1 $^1/_2$ to 2 ounces daily; of the tincture (1 part to 10), 5 to 10 minims. The U. S. P. fluid extract, in doses of from 10 to 30 minims, is a valuable preparation.

Physiological Action. — Apocynum produces a very pronounced retardation of the pulse, with a very considerable enlargement of the pulse-wave and a marked rise of the blood-tension. The initial retardation of the heart is followed by an acceleration of the cardiac action, while the arterial pressure ascends still further. The cardiac retardation (first stage) is caused by an irritating action of the drug, both on the central and peripheral inhibitory apparatuses. The subsequent acceleration (second stage) is not dependent upon anything like paralysis of the inhibitory apparatus, since the injection of another dose of the infusion can again give rise to a retardation of the heart's work.

On the injection of a very large dose the two stages are followed by a third one, which is characterized by cardiac

arhythmia, the appearance of Traube's waves, and a gradual fall of the blood-pressure down to 0. The rise of the blood-tension during the first and second stages is dependent not only upon the stimulation of the vasomotor centres in the medulla oblongata, but also (and that in a very considerable degree) upon the excitation of the spinal vasomotor centres. Moreover, the heart and blood-vessels themselves take a certain active part in the causation of the rise. Both the central and peripheral vasodilatory apparatuses remain wholly intact. (Sokaloff.)

Literature of '96-'97-'98.

The physiological action of apocynum is clinically: To strengthen and tone up heart-action; to regulate markedly the irregular heart—not slowing the normal heart, nor increasing the blood-pressure, there being no contraction of the arteries. Its diuretic action is indirect and due to its "cardiokinetic" effect, and not through stimulation of the renal epithelium. Decoctions of the drug cause mainly catharsis and emesis. Dose of the tincture is 20 drops, increased to 30 drops thrice daily. T. S. Dabney (Ther. Gaz., vol. xxii, p. 730, '98).

Therapeutics.—The action of the root of the *Apocynum Cannabinum* is similar to that of digitalis, without being cumulative.

Cardiac Affections.—In cases of cardiac dilatation the fluid extract rapidly diminishes the area of dullness. In cases of mitral and aortic insufficiency, with disturbed compensation, it is also valuable.

The action of the root of *Apocynum Cannabinum* is similar to that of digitalis without being cumulative. In cases of dilatation the fluid extract rapidly diminishes the area of dullness. It increases the daily amount of urine, stops the palpitation, and promotes the absorption of transudations. With the exception of increased pulsation of the arteries of the head, it has no bad secondary effects. A. G. Glinski (Wratsch, '95).

Literature of '96-'97-'98.

Seven cases of mitral and aortic insufficiency with disturbed compensation in which the fluid extract of apocynum, 15 drops three times a day, was used. Great improvement noticed within three days. The cardiac impulse grew stronger, the pulse became more regular, fuller, and slower, its frequency in some instances decreasing from 130 or 120 to 56 or even 48 per minute, in 48 hours. The blood-pressure rose; cyanosis and pulsation of the cervical vessels vanished; the area of cardiac dullness decreased; the daily quantity of urine increased (in one case it rose from 450 cubic centimetres to 2800 cubic centimetres); the body-weight fell, the diminution varying from thirteen to twenty-one Russian pounds. No unpleasant accessory effects from the drug noticed. Grozdinsky (Wratsch, No. 19, '96).

Dropsy.—The main usefulness of apocynum, especially when the fluid extract is employed in doses of 7 to 8 drops, is in the treatment of dropsies. Such a dose, repeated at short intervals if necessary, causes copious watery discharges from the bowels, the flow of urine being increased. As tolerance is established by continued use, it is necessary to increase the dose when given for a long time. (Richmond.)

It is also possessed of diaphoretic powers, which exert an effect upon the dropsy.

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Apocynum properly administered is a very remarkable diuretic. Doubtless it acts indirectly by increasing the arterial pressure, but it must also be a direct renal stimulant, and cause dilatation of the renal arterioles. So far as I know, this has not been demonstrated, but the

effects point to such a mode of action. Its influence is best seen in those general effusions that depend upon a want of vascular tone, and, whatever the reason, the empirical fact remains that most remarkable results have followed its use. A. A. Woodhull (Brit. Med. Jour., Dec. 11, '97).

Violent catharsis and emesis follow its abuse and not its intelligent use, and it is a really trustworthy and singularly efficacious hydragogue, especially in anasarca. The true value of properly-administered apocynum is as a diuretic. It doubtless acts indirectly by increasing the arterial pressure, but it must also be a direct renal stimulant, and cause dilatation of the renal arterioles. A. A. Woodhull (Brit. Med. Jour., Dec. 11, '97).

To assist in removing the solid œdema which often prevents the healing of varicose ulcers in the aged, apocynum has proved more useful than any other drug. F. R. Millard (Med. and Surg. Reporter, Apr. 16, '98).

APOMORPHINE.—Apomorphine is a pseudo-alkaloid obtained by the action of HCl on morphine in sealed tubes at a high temperature. The base can be obtained from the resulting hydrochlorate of morphine by dissolving in water, adding excess of bicarbonate of soda, and extracting by means of ether or chloroform. It is soluble in hot or cold water and in alcohol. In powder it is white; but a watery solution, though at first colorless, soon turns black.

The salt generally employed, however, is the hydrochloride: made by adding a small quantity of hydrochloric acid to a solution of apomorphine. It occurs in grayish-white crystals, which are odorless and slightly better. It becomes green on exposure to light and air.

Dose.—For adults $^1/_{15}$ to $^1/_5$ grain. Great care must be observed in using it in feeble persons. Death has been caused by $^1/_{15}$ grain under such circumstances. For a child of 18 months, $^1/_{50}$ grain; 2 years, $^1/_{40}$ grain; 3 years, $^1/_{35}$ grain; 5 years, $^1/_{30}$ grain; 8 years, $^1/_{25}$ grain. One-fifth of a grain should not be surpassed in any case when given hypodermically, and $^1/_4$ grain when administered by the mouth.

The drug acts with more vigor in some individuals than in others. Its effects, therefore, should be watched.

Case of a drunkard in whom $^1/_{10}$ grain of apomorphine, hypodermically administered, followed in five minutes by another $^1/_{40}$ grain, caused collapse, unconsciousness, cold surface, and absence of pulse at the wrist. Westby (Brit. Med. Jour., Feb. 2, '89).

When administered on an empty stomach, apomorphine produces vomiting much more readily than when administered after meals. The rate of absorption has much to do with the entire effect. When given hypodermically, it is absorbed at once; when given on an empty stomach, it is absorbed more rapidly than when mixed with foods. Murrell (Brit. Med. Jour., Feb. 28, '91).

A very important fact is the great tendency to decomposition shown by apomorphine hydrochloride on exposure to moisture or moist air. As it is also affected by light, it should always be kept in amber-colored bottles. Again, it should never be kept in solution, the latter being always made fresh when it is to be used. Serious symptoms have followed neglect to heed this precautionary measure.

Its purity may be tested by shaking up in a test-tube a 1-per-cent. solution. If the latter turns emerald-green, it should not be employed. (U. S. P.)

Physiological Action.—The physiological action of apomorphine as an emetic may be gathered from its symptomatology, which is as follows: The administration of $^1/_{10}$ grain hypodermically is followed in scarcely one-half

minute by fullness of the head; the pulse is quickened and increased in volume; the pupils slowly dilate; the face is flushed. Perspiration soon appears; the respirations become more frequent and the heart-beats more rapid; and before two minutes elapse emesis is produced. Then comes the reaction, a general relaxation, lasting about an hour. The eyes are sunken, the pupils are widely dilated, and the face is pallid and drawn. Yawning inaugurates the period of recovery; sleep follows and upon awakening all effects have passed away. (W. D. Carter.)

These effects indicate that the physiological action of apomorphine must be multiple. This has been found to be the case in experiments upon animals. The drug seems first to excite the cerebral centres, then to depress them. The peripheral arteries become prominent and tense, indicating arterial tension, due to increased rapidity and force of cardiac action.

It is primarily a stimulant and finally a paralyzant. In excessive doses it causes convulsions, but in a manner not yet fully understood.

Therapeutic doses have no appreciable effect aside from acceleration of the pulse-rate, the maximum being reached about the time vomiting begins. This is due to stimulation of the accelerator mechanism. Following vomiting the pulse-rate decreases,—the probable result of depression of the heart-muscle, since it has been shown that apomorphine is a muscle-poison.

The respirations are usually increased, though variably so, after decided doses. In case of lethal dose respirations cease as a result of paralysis of the controlling centres.

Apomorphine has very slight, if any, influence upon temperature.

Apomorphine Poisoning.—When poisonous doses are given to animals, the opposite of the above is the case; depression of cardiac action first occurs, followed by weakness and rapid pulse.

The drug also acts as a convulsant through its influence upon the spinal cord, the convulsions being accompanied or followed by muscular paralysis. The respiratory centres are also deeply involved and death occurs from respiratory paralysis.

In the human being toxic doses of apomorphine produce collapse, unconsciousness, failing circulation and respiration, and all the symptoms of profound depression of the vital centres. Convulsions usually precede the profound depression, and vomiting rarely occurs.

Treatment of Poisoning.—The antidotes are strychnine, chloral, and chloroform. These should be supplemented by the more diffusible stimulants, as ammonia, whisky, coffee, etc., together with external heat.

Therapeutics.—Apomorphine is doubtless the most reliable of our emetics and the one which acts most rapidly, but the effects obtained depend greatly upon the quality of the drug used. Untoward effects of various kinds have been reported, including, besides those added to the normal action of apomorphine, marked depression. This latter has occasioned a certain amount of distrust on the part of the profession, which, however, has no reasonable basis, provided a pure drug can be obtained, and proper precautions are taken, the most important of which is to prepare the solution at the very moment it is to be administered.

The value of apomorphine—according to Carmichel, who voices the experience of pediatricians who have used the remedy extensively—cannot be too

highly esteemed as an emetic for children; the average time at which emesis occurs is much less than the period required by the yellow sulphate of mercury. It affords prompt relief in croup and capillary bronchitis without being attended by nausea and violent retching, which makes it a great boon to children.

It is an expectorant, in doses ranging from $^1/_{80}$ to $^1/_{20}$ grain. As such it affords great relief in cases of bronchitis, tracheitis, and catarrhal pneumonia.

A spray of apomorphine in weak solution is sometimes recommended, but its use in this manner is hardly safe. It has been found valuable in whooping-cough to relax spasmodic attacks. (Ingram.)

> Apomorphine, mixed with lanolin and applied to the skin, is a most valuable expectorant. For infants the strength of the ointment should be 1 grain to the ounce, the ointment being rubbed over the body three times a day, the skin being previously thoroughly cleansed. C. Smith (Texas Courier Record, Apr., '91).

Bronchitis. — Murrell recommends that apomorphine be given in large doses as an expectorant in this disease: $^1/_2$ to $1^3/_4$ grains. He also obtained excellent results from an ointment of: apomorphine, 1 grain; lard or lanolin, 1 ounce; the half of which is rubbed into the chest: a point of very great practical importance, especially in the treatment of children. Murrell also observed the expectorant effect in many by using the apomorphine as a spray. It was very marked when the drug was used in large doses, and a dose which would act as an emetic, if administered hypodermically, can be used as an inhalation without giving rise to this result.

Croup.—In croup, where the case is urgent or where an expectorant effect is desired, $^1/_{100}$ or $^1/_{60}$ grain every fifteen minutes gives the happiest effect. As relief comes, the time of dosing is extended to one or two hours, but the minimum dose is continued. When it is desirable to evacuate the stomach promptly, no remedy meets the case better than apomorphine. Cardiac depression following the use of the remedy should be promptly met by suitable stimulants and tonics.

Gastralgia.—From the fact that it produces emesis by its action through the spinal nerve-centres, and not by irritation of the mucous membrane, it is a preferable remedy in inflammatory conditions of the stomach where emetics are indicated.

> Case of indigestion and violent gastralgia in which apomorphine was given hypodermically to produce emesis. Within two minutes the patient was entirely free from pain, fell asleep and slept for an hour, and was perfectly comfortable afterward. S. F. Morris (N. Y. Med. Jour., Nov. 10, '94).

Poisoning.—The value of apomorphine as an antispasmodic is attested by Edward Balm, of Hyderabad, who tried it in a distressing case of hiccough in a man, 50 years old, who had suffered from the affection for about six months. It is thus shown to be doubly valuable as an emetic in cases of poisoning from the ingestion of such drugs as strychnine, that cause tetanic manifestations, although after poisonous doses of drugs such as chloral—in which the symptoms are quite the opposite—it is equally useful.

> Case of attempted suicide by strychnine in which the patient had swallowed a pill containing 1¾ grains of the drug. Apomorphine, cutaneous frictions, cold douches, chloral-hydrate, and bromide of potassium brought about recovery. J. Augustin and P. Flor (Spitalul, Nos. 11, 12, '94).

Case in which recovery followed after a large dose of chloral. The patient, a young man, had taken suicidally 3 ounces of syrup of chloral (B. P.). He was found in the morning unconscious, with cold, clammy, and livid body; stertorous respiration; small and quick pulse, and dilated pupils. The treatment consisted of an hypodermic injection of $^1/_{10}$ grain of apomorphine, which was followed immediately by profuse vomiting; the injection of a pint of hot, strong coffee; heaters, and flagellation. After two hours of treatment the patient could speak and swallow hot coffee. He continued to improve, and in twelve hours more, though somewhat dazed, had practically recovered. Holburton (Brit. Med. Jour., Nov. 12, '92).

In very severe cases it may be necessary to administer $^1/_{10}$ grain every ten minutes until some effect is obtained, or exhibit $\frac{1}{4}$ grain at a single injection. In feeble persons and in children great caution must be exercised.

Case of strychnine poisoning in which apomorphine, in doses of $^1/_{15}$ to $^1/_{10}$ grain, subcutaneously injected, completely subdued the convulsions, and, eventually, successfully antagonized the excitant alkaloid. Horsley (Canadian Practitioner, Dec. 6, '90).

Case of a man who took a large dose of bromidia and became violently insane, requiring three men to control him. Soon after receiving $^1/_{10}$ grain of apomorphine he vomited, had a movement of the bowels, his mental condition was relieved, and he slept well the remainder of the night. Ingram (Southern Med. Record, Apr., '92).

Hysterical Crises.—Apomorphine has been employed in a large number of minor hysterical phenomena, in which the remedy gave prompt relief. The amounts used varied from $^1/_8$ to $^1/_{20}$ grain, hypodermically administered, and were never followed by any alarming symptoms. (Horsley.)

Case of hysterical crisis (opisthotonos) in which $^1/_{20}$ grain of apomorphine was given hypodermically. As soon as vomiting occurred relaxation and complete relief followed. L. G. Stevens (St. Louis Med. and Surg. Jour., June, '89).

Case of a young woman, 25 or 30 years of age, who was found drunk, hysterical, and hard to control. Apomorphine, hypodermically, in a single dose of $^1/_{10}$ grain, caused the patient to vomit freely. She then became relaxed, and rested quietly. Ingram (Southern Med. Rec., Apr., '92).

APOPLEXY. See Cerebral Hæmorrhage.

APPENDICITIS (from Latin *appendere*, to hang on; and *itis*, inflammation).

Definition.—An inflammation of the vermiform appendix, frequently complicated with ulceration and perforation of its coats, caused by microbic infection, which may originate from irritation produced by hardened fæcal masses, foreign bodies, or traumatism.

Symptoms. — Whether catarrhal or ulcerative, the attack presents itself usually in a previously healthy person and begins with sudden intense pain in the right iliac fossa, frequently localized at a spot one and one-half to two inches from the anterior superior spine of the ileum toward the umbilicus (McBurney's point), and increased by pressure. This is the most important diagnostic sign when associated with the other symptoms. The pain may radiate from this point toward the umbilicus, the epigastrium, the groin, and the testicles, and be attended by exacerbations. It may be felt in other parts, especially the epigastrium and the umbilicus, and may even be located in the left iliac fossa.

The McBurney point is misleading; much more emphasis is generally placed upon its value than McBurney himself does. Richard H. Gibbons (N. Y. Med. Jour., Apr. 18, '91).

The McBurney point is largely without

value, uncertain in its location, apt to be mistaken for points of tenderness due to wholly different causes. William Pepper; Thomas Bryant (Buffalo Med. and Surg. Jour., Dec., '90).

McBurney's point is valueless because the tender spot is very changeable. Gage (Boston Med. and Surg. Jour., May. 24, '94).

The localized point of tenderness is frequently referred to the left side. Deaver (Boston Med. and Surg. Jour., May 23, '95).

The pain is often referred to the epigastrium alone and sometimes to the umbilical region. Joseph Price (Buffalo Med. and Surg. Jour., Dec., '91).

Three cases from eleven operated upon in which the pain was more marked on the left side, especially at the outer border of the rectus. Appendix found to the left of the rectus. Fowler (Medical News, Nov. 25, '93).

Analysis of symptoms in three hundred recorded cases showing that the most important symptom is pain in the right iliac fossa; McBurney's point is important if associated with the other symptoms. George F. Shrady (N. Y. Med. Record, Jan., '94).

Nausea and vomiting are present in the majority of cases, but it does not furnish any information as to the seriousness of the case.

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Vomiting present in 208 out of a series of 306 cases; it bodes neither good nor ill. Hood (Lancet, Sept. 18, '97).

The pulse is usually high, but the temperature-chart shows but little, if any, rise.

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The most important point to bear in mind in the diagnosis of appendicitis is the fact that the temperature of the patient is a matter of no consequence as giving any clue to the condition of the appendix. R. T. Morris (Med. Record, Dec. 26, '96).

Anorexia and digestive disorders are rarely absent. Diarrhœa and constipation alternate, but either symptom may be a prominent one during the entire course of the attack.

Rigidity of the right abdominal wall is generally present, but circumscribed rigidity over the region of the appendix is present in about one-half of the cases.

Circumscribed muscle-tension was observed one hundred and twenty times in three hundred cases. Shrady (N. Y. Med. Record, June 6, '94).

If the case be one of simple catarrhal appendicitis, the above symptoms continue two or three days and the patient gradually recovers.

Variations from the above course are occasionally met with. The disease may come on insidiously and fever or pain be totally absent. Although such an onset is occasionally met with in adults, it is most likely to occur in children. Occasional colicky pains are sometimes the only early signs furnished, these being followed by the typical symptoms described above. Slight appendicular lesions may be accompanied by alarming symptoms in hysterical patients, or in those mentally and physically below par.

Spurious symptoms often cause hesitation. Case in which there were five attacks with symptoms of pericæcal abscess and intestinal adhesions. Soft and rather large appendix the only conditions present. In a second case, in which the only symptom was a painful spot, at least half a pint of pus found. Routier (Le Bull. Méd., Jan. 30, '95).

Symptoms present an increased degree of seriousness in patients physically and mentally below par; in these we are more likely to have an abscess. Robust individuals present a large percentage of recoveries, but in them a very dangerous perforative appendicitis may occur. Vander Veer (Albany Med. Annals, Feb., '93).

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The symptoms in a case of mild catarrhal appendicitis cannot at present, with certainty, be distinguished from those marking onset of case of the gravest type. J. W. White (Brit. Med. Jour., Feb. 9, '96).

When examining a patient great attention should be paid to the unequal susceptibility shown by various individuals; some react but little, while others, on the other hand, show reflex symptoms of great intensity. Two cases showing that very slight appendicular lesions in hysterical patients may be accompanied by extremely alarming symptoms. Rendu (La Méd. Mod., Mar. 24, '97).

Progress toward simple perforation or perforation into a cavity bound by adhesions is probable, when on the third day after the onset of the symptoms there is localized superficial œdema, indicating deep suppuration, and when a doughy mass is felt at the seat of pain, which mass gradually assumes shape to the touch, unless distended intestinal coils, shown by local tympanites, or the tension of the abdominal walls makes its detection impossible.

Diagnosis is made almost certain by the presence of a bunch, usually situated in the right lower quadrant of the abdomen or near the liver or left side. It may be obscured by abdominal distension or muscular rigidity. Gay (Boston Med. and Surg. Jour., Jan. 3, '95).

In three hundred cases the tumor in the right iliac fossa rarely showed itself before the third day of pain and tenderness. A tumor, may, however, be due to accumulation of fæces in the cæcum. Dullness on percussion is rarely recognized before the fourth day. G. F. Shrady (N. Y. Med. Record, Jan. 6, '94).

The presence of a recent tumor is a strong corroborative sign of appendicitis, but not a certain one. D. W. Cheever (Boston Med. and Surg. Jour., July 9, 16, 23, '91).

The presence of slight œdema over the loin is an indication of the presence of deep-seated suppuration. Symonds (Brit. Med. Jour., Jan. 26, '95).

Fluctuation does not generally occur until the second week. Œdema of the overlying integument does not occur until a paratyphlitic abscess has formed. G. F. Shrady (N. Y. Med. Record, Jan. 6, '94).

If suppuration is present and perforation occurs on the fourth or fifth day,—*i.e.*, after the adhesions have formed,—the symptoms do not, as a rule, vary from those enumerated. When, however, they do not assume a graver form during the first four days, the presence of protective adhesions is likely.

Danger may exist without being shown by pulse or temperature. Pulse, temperature, and pain may decline, marking the occurrence of effusion,—a deceptive calm. The sudden access of intense localized pain indicates a dangerous change in the local conditions. G. F. Shrady (N. Y. Med. Record, Jan. 6, '94).

A pulse-rate of 120 indicates a considerable infection, and, according to some, is an absolute indication for operation. Richardson (Amer. Jour. Med. Sciences, Jan., '94).

The temperature is absolutely no guide in determining the severity of an attack. The pulse is about the only reliable guide. Syms (N. Y. Med. Jour., May 28, '95).

Too much stress must not be laid on the temperature, as recovery may follow a temperature of 105° F. and death may occur with one nearly normal. Richardson (Amer. Jour. Med. Sciences, Jan., '94).

When the symptoms are marked and a tumor cannot be felt, perforation has probably occurred before the adhesions were sufficiently perfect to protect the peritoneal cavity.

If perforation has occurred early,—*i.e.*, while the adhesions were still imperfect,—there is usually a chill and vomiting; shock, more or less profound;

diffuse, marked pain, instead of the localized pain; acceleration of the pulse; an increase of temperature of 2° or 3° F.; scanty and dark urine, showing high specific gravity.

Perforation, usually supposed to occur on the fourth, fifth, or sixth day, may occur at the onset, and probably does so in those cases beginning with sudden pain. Richardson (Amer. Jour. Med. Sciences, Jan., '94).

If, during an attack, a sudden diffuse pain and other evidences of shock are experienced, ulcer of the appendix or rupture of an abscess into the peritoneal cavity is almost certain. Keen (College and Clin. Record, Nov., '94).

Suddenness of attack with severe pain and vomiting, followed by a remission of symptoms are the diagnostic signs of perforation. Graser (Münchener med. Woch., Mar., Apr., '92).

When, in a child or adult enjoying habitual good health, the signs of acute peritonitis are observed, the possibility of perforation of the appendix should be considered; and if these signs have been preceded by a violent colic, with pain localized in the right iliac fossa, it may be affirmed. Talamon (La Méd. Mod., Nos. 2, 3, '92).

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Pain, if violent, sudden, and persistent, denotes probable seriousness of the attack, but indicates nothing as to the rational defenses for limiting infection. On the contrary, absence of pain is indecisive between gangrene and resolution.

Perforation can be no more foretold than the perforation of typhoid or the rupture of an aneurism. Opinion of several leading American surgeons. Crutcher (International Jour. of Surgery, Jan., '97).

Perforation is also accompanied by distension of the abdomen, and symptoms of grave diffuse peritonitis appear, followed by collapse.

Distension of the abdomen depends, for its importance, upon its cause. Opium may cause it or gas may form. If peristalsis is not inhibited no alarm need be felt. Distension due to local infection is of the gravest import. Richardson (Amer. Jour. Med. Sciences, Jan., '94).

General abdominal distension is the most dangerous symptom. Gage (Boston Med. and Surg. Jour., May 24, '94).

Increase of both pulse and temperature from a condition showing a slightly accelerated pulse and a temperature of 100° to 101° F., combined with increase of the other symptoms, indicate a dangerous condition. G. F. Shrady (N. Y. Med. Record, Jan. 6, '94).

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The patient's expression is of no material value before the development of grave conditions. Opinion of several leading American surgeons. Crutcher (International Jour. of Surgery., Jan., '97).

The actinomycotic form is characterized by slower progress and less acute symptoms.

Case of actinomycotic appendicitis; differential diagnosis based upon its slow, painless growth; the tissues about it are infiltrated, and there are numerous fistulous tracts formed. No involvement of glands. Isolated and circumscribed in the peritoneal cavity. Jumon (La Semaine Médicale, Sept. 1, '92).

In the rheumatic form there is much tenderness over the appendix. No tumor or dullness can be detected. Arthritis, however, is present.

Case of rheumatic perityphlitis showing much tenderness in the right iliac fossa, but no tumor or dullness; with arthritis. The diagnosis proved by the fact that the salicylates rapidly produced a beneficial effect. J. Burney Yeo (Brit. Med. Jour., June 16, '94).

Similar case, which yielded to the salicylate of soda. Haig (Brit. Med. Jour., June 30, '94).

The infectious form is distinguished by a rapid course.

The disorder called by Poncet "acute infectious appendicitis" is distinguished by its rapid involvement of the peritoneum, without ulceration, perforation, or gangrene. It results from occlusion of the orifice of the appendix by inflammation, and absorption of its contents; the presence of the bacillus coli communis is thought also to have an important influence. Clinically, it does not differ from other forms of the disease except in its rapid course. Margery (Jour. de Méd. et de Chir. Pratique, Feb. 25, '93).

When appendicitis occurs during pregnancy, the attack is usually sudden and begins with abdominal pain which gradually becomes localized; this is followed by the typical symptoms. This condition must be carefully differentiated from tubal pregnancy. The prognosis is grave.

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Study of fifteen cases of appendicitis complicating pregnancy; four personal. There is a certain uniformity of the symptoms. History of constipation and sudden onset of acute abdominal pain, which gradually becomes localized over the appendix, or is associated with vomiting and marked signs of fever. Vaginal examination gives negative results. In the early months of pregnancy these symptoms may also be the result of right tubal pregnancy, or inflammatory conditions of the right uterine appendages, differentiated by the fact that they can be palpated by vaginal examination. The prognosis extremely grave. Of ten suppurative cases, seven died. Abrahams (Am. Jour. of Obst., Feb., '97).

Diagnosis, General.—During examination gentle manipulation is necessary, lest an abscess be present and the adhesions be delicate and unable to stand the traction or pressure.

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The amount of manipulation necessary to make a complete diagnosis should be of the very lightest possible kind. Anything more than very light manipulation in one of these cases must be accompanied by a certain amount of danger, because we do not know the thickness of the barrier between abscess-cavity and the peritoneum. McBurney (Buffalo Med. Jour., June, '96).

The location, direction, and extent of the appendix have an important bearing on the clinical history of appendicitis, considering the variations of the appendix in length, direction, and location, and the varying site of the cæcum.

Errors from displacement of appendix: Case in which only the left testicle was found in the scrotum and in which a diagnosis of orchitis and ectopia of the right testicle was made. On operating the appendix found instead of the testicle. Tillaux (Jour. de Méd. et de Chir. Pratiques, Nov. 10, '94).

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It is quite possible to feel the normal appendix in most cases. If one palpates gently with two or three fingers on the opposite side one can readily get the landmarks. The ascending colon is the first landmark. Three fingers are placed upon the rectus muscle, then brought down over the edge of the muscle, three fingers of the right hand being used to feel with and the three fingers of the left hand to press with. The examining fingers are pressed by means of the three others down under the border of the right rectus abdominis muscle at the level of the navel, and slowly drawn to the examiner. The landmark, the ascending colon, is then felt to slip out from under the fingers, and, by repeating the process toward the cæcum, one soon comes to the end of the latter, and there begins to hunt for the appendix by rolling the cæcum to one side or the other of the finger-tips. The proximal end of the appendix is found near the distal end of the cæcum; the remainder of the appendix is followed in any direction. The proportion of appendices that cannot be palpated will become smaller as the finger-tips become educated. The very

delicate sense of touch is preserved if the left hand is used for pushing upon the examining hand. Robert T. Morris (International Jour. of Surg., Aug., '98).

Ausculation of the lungs and heart sometimes affords information.

Study of eighty-eight cases, 11 per cent. of which showed an accentuation of the pulmonary second sound. J. Mannaberg (Centralb. f. klin. Med., Mar. 10, '94).

Examination through the rectum is of value in determining the presence of pus in advanced cases.

It is often impossible to decide positively as to the presence of pus in the neighborhood of the appendix. A rectal examination ought to be made in doubtful cases. Affleck (Int. Med. Mag., Oct., '93).

Method of examining the appendix through the rectum in the early stages is of no value whatever. McBurney (N. Y. Med. Record, Apr. 16, '92).

Examination of the urine may assist in the location of the inflammatory process and in determining the activity of metabolic processes. Glycosuria was also found present in three cases examined by Leidy.

If the affection present is one belonging to the territory of the portal vein, the urates will be found greatly increased. If, on the contrary, the affected organs are within the regions that are tributary to the vena cava, no increase will be observed. Darier, Soboleski, L. Revilliod (Revue Méd. de la Suisse Rom., Nov., '91).

Diagnosis, Differential.

Intestinal Obstruction.—In this disorder the rise of temperature occurs late. Stercoraceous vomiting is observed in serious cases. Volvulus generally presents itself in children.

Case in a female, aged 49 years, simulating appendicitis; distinct tumor, the size of hen's egg, at McBurney's point. Pain constant; chills; temperature, 102° F. (38.9° C.); no vomiting. Appendix found normal. The tumor simulating malignant neoplasm. Abdomen closed and a fatal prognosis given. Thirty days later an enterolith the size of a lemon passed. Recovery. Jonas (N. Y. Med. Record, Mar. 3, '94).

Typhlitis.—This disease is characterized by a gradual onset, a typhoid course, and a prolonged convalescence.

In typhlitis the onset is gradual, resembling typhoid fever; the tumor is a boggy mass, longest in the vertical direction; the convalescence is slow, perforation rare, and the whole process is usually benign. Azoulay (Gaz. Méd. de Strasbourg, Jan. 1, '94).

The pain on pressure in typhlitis is dull, while in appendicitis it is sharp. Typhlitis is more a disease of corpulent aged individuals leading a sedentary life; appendicitis is an affection of young adult males. Benoit (L'Union Méd. du Canada, Mar., '94).

Tubercular Typhlitis.—Slow asthenic course, diarrhœa, and a higher temperature usually distinguish this disease.

The diagnosis between appendicitis and tuberculous typhlitis is often obscure. The latter may be localized at one point of the cæcum, causing a small, hard tumor without viscous surroundings. Richelot (L'Union Méd., Nos. 39, 40, '92).

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Case in which symptoms of appendicitis were such as to leave little room for doubt. Nevertheless, the appendix was free from disease, and tuberculous ulceration and narrowing of the cæcum were alone found after death to account for the symptoms. H. W. Page (Lancet, July 3, '97).

Tumors.—In cancer—the neoplasm which occurs most frequently in the intestines—the subject is usually beyond his fortieth year. Slow progress and the cachectic face are important differentiating signs.

Case of epithelioma of the cæcum and appendix simulating recurrent appendicitis. Sourdille (Bull. de la Soc. Anat., Dec., '94).

Case of sarcoma of appendix simulating appendicitis. Glazebrook (Va. Med. Monthly, May, '95).

Judgment should not be passed too hastily on tumors in the cæcal region; eight cases in which tumors of that region were connected with the cæcum. Richelot (L'Union Médicale, Apr. 2, '92).

Literature of '96-'97-'98.

Myxoma of vermiform appendix simulating recurrent appendicitis, in a girl, aged 23, admitted with a history of two attacks of (supposed) appendicitis. The appendix was thickened at the end, and upon being opened showed a pellucid shining tumor the size of a small bean. No record of a similar specimen found. Churton (Brit. Med. Jour., May 15, '97).

Mobility of the supposed perityphlitic exudation and absence of fever may lead the surgeon to expect an impacted gall-stone rather than obstruction resulting from appendicitis. Kölliker (Centralb. f. Chir., No. 42, '97).

In the case of a boy with symptoms of chronic appendicitis there was found by operation a round-celled sarcoma of the appendix with involvement of the mesenteric glands; patient recovered after removal of the cæcum, a portion of the ileum, and a V-shaped piece of mesentery. J. C. Warren (Boston Med. and Surg. Jour., Feb. 24, '98).

Anomalous cases of appendicitis which may be mistaken for neoplasms in the iliac fossa. A hard tumor develops slowly, with progressive emaciation and cachexia. After a long period the mass becomes softer, evidences of suppuration appear, and on making an incision pus is evacuated, the tumor then disappearing. Legueu and Beaussenat (Revue de Gynéc. et de Chir. Abdom., No. 2, '98).

Typhoid Fever.—Perforation occurs late in this disease, while the temperature, the petechiæ, and other characteristics readily serve to distinguish it.

Perforation of the small intestine is usually overlooked in connection with appendicitis. It may be due to typhoid fever, tuberculosis, intestinal uræmia, foreign bodies, etc. Letulle (La Presse Méd., Apr. 13, '95).

In a case of apparent appendicitis in which an exploratory puncture and drainage had been resorted to, the autopsy showed that the trouble had arisen from perforating ulcer of duodenum. Bryant (N. Y. Med. Record, Jan. 5, '95).

Disorders of the uterus, adnexa, and pelvic cellular tissue, especially salpingitis, are conditions which may cause confusion, especially the latter. Examination of the genito-urinary organs sometimes establishes the differential diagnosis.

By placing the patient on her left side with the shoulders low and the legs drawn up, it is much more easy to detect the position and condition of the appendix and also to differentiate it from the uterine adnexa than by palpation of the patient lying on her back. Even when no great intestinal distension is present, the depth at which the appendix might lie is greater, and the tension of the abdominal walls is likely to be more marked in the dorsal position than when this lateral method is employed, if no intestinal adhesions are present. (J. C. Simpson.)

In appendicitis the pains are more violent, but more strictly localized, and radiating pains are absent. In catarrhal salpingitis, especially if the ovaries share in the inflammation of the tubes, the pains radiate toward the thigh; the alarming symptoms also show a noticeable remission toward the third or fourth day. (Vineberg.)

In an acute progressive case the abdomen is so rigid that deep palpation is difficult and dangerous. A rigid abdomen is the principal differential sign

between acute appendicitis and salpingitis. (R. T. Morris.)

In each case the possibility of salpingitis must be kept in mind. The uterus and adnexa should be thoroughly examined by the combined method,—vagina and rectum. Vineberg (Charlotte Med. Jour., July, '95).

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Tubal pregnancy mistaken for appendicitis. Case in which the pain was in the right side, the tumor being behind the uterus on the right side. A surgeon of distinction diagnosticated appendicitis, and recommended operation. All who examined her thought they felt the thickened appendix. On operation, although the patient was a young girl of exceptional character who had given no history of passing by a menstrual period, tubal pregnancy found. William T. Lusk (Univ. Med. Jour., Jan., '97).

Case where, in a young unmarried woman, an inflammatory condition of the ovaries and tubes was associated with a typical appendicitis, although he latter condition was only detected on operation. P. Michinard (New Orleans Med. and Surg. Jour., Mar., '97).

Case of what appeared clearly to be appendicitis complicating pregnancy, although the possibility of typhoid fever was not excluded. At operation an absolutely normal appendix was found, and nothing to account for the patient's symptoms. Howard Lilienthal (Univ. Med. Jour., Jan., '97).

Simple appendicular colic or parietal inflammation of the appendix may be accompanied, in hysterical persons, especially women, by nervous symptoms, simulating severe diffuse peritonitis. Talamon (Méd. Mod., No. 24, '97).

Three cases of tubo-ovarian congestion diagnosed as appendicitis. Colicky pains in the right iliac region five days after the end of the menstrual period; similar attack a year previously. A rectal and vaginal examination revealed a retroflexed uterus, with enlarged tender ovary and tube on the right side. J. C. MacEvitt (Brooklyn Med. Jour., Apr., '97).

Six cases of appendicitis in the female in which it was impossible to positively establish the diagnosis before opening the abdomen. If the pain and the tumor are high up in the region of the right tube and ovary, appendicitis probably present. If the hymen is intact an inflammatory enlargement on the right side is probably due to appendicitis. Richelot (Le Gynéc., June, '97).

Nothing short of an exploratory incision can enable the most expert surgeon to diagnose the true nature of appendicitis in some cases. R. Faries (Annals of Surg., July, '98).

Acute puerperal parametritis may begin in the same manner as perforation of the appendix, but the symptoms are less severe, those of diffuse peritonitis being absent.

It is more difficult to distinguish between perforation of the appendix and the rupture of a pus-tube or ovary. If recovery takes place, the parametritis and paratyphlitic exudates can usually be diagnosticated by their characteristic shape and position. Krüger (Deut. Zeit. f. Chir., B. 45, H. 3 and 4).

Diagnosis is not easy when inflammation of the right tube and ovary and of the appendix occur at the same time. We have in both rapid pulse, rise of temperature, pain, vomiting, and tympanitis. However, appendicitis begins more acutely. If a chronic case, there is a history of one or more former sharp and sudden attacks. Lesions of tubes and ovaries are of older date and have a history of menstrual disorder. Pain of appendicitis is acute, frequently violent, beginning over the solar plexus, radiating over the whole belly, and finally settling in the right iliac region. In adnexal disease the pain is dull and heavy, and never sharp and lancinating until the peritoneum is involved. Patient is more alarmed in appendicitis than in disease of the adnexa. Location of tenderness is different: in appendicitis it is on a level with the anterior spine; in adnexa, trouble is in the pelvis. In the latter, vaginal examination reveals the site of tenderness; in the former, one can touch and move the organs in the pelvis without producing pain. Vomit-

ing is more common in appendicitis. Rigidity of the muscles of the abdominal wall over the right iliac region is almost always present in appendicitis, and generally absent in inflammation of the tubes and ovaries. In case of doubt chloroform should be given, and by its aid the enlarged and tortuous appendix can be felt or by a bimanual examination disease of the adnexa may be discovered. Hunter McGuire (Southern Med. Record; Canada Lancet, May, '98).

Miscellaneous Disorders.—According to Deaver, *movable kidney* is to be differentiated as follows: In appendicitis there is more apt to be fever and increased pulse-rate, the rigidity of the abdominal wall does not involve such a large area, there is a circumscribed and acutely-tender point, the tenderness is more superficial, and there is an absence of a movable tumor which readily slips from between the examiner's fingers.

Infectious catarrhal *inflammation of the bile-ducts* and ulceration of these ducts may occasionally simulate appendicitis. Biliary colic is to be differentiated by jaundice, absence of fever, peculiar color of the stools, finding of gall-stones in the passage, and by the more severe and continuous pain, radiating usually from the chest-margin to the umbilicus.

Simple *empyema of the gall-bladder* is diagnosed by the onset, the location and character of the pain and tenderness, and by the area and degree of rigidity.

Acute *phlegmonous cholecystitis* and gangrene of the gall-bladder may usually be diagnosed by the existence of more acute symptoms, more general peritonitis, by the rapid and shallow respiration, location of the pain and tenderness, and by the greater tendency to a rapidly fatal issue.

Perforated gastro-intestinal ulcers are diagnosed by predisposing age, history of previous gastric or intestinal disturbances, sudden acute pain in the epigastrium, followed by collapse, and lastly by the presence of bloody vomiting, or, in the case of intestinal ulcers, by the hæmorrhage from the bowel. Perforation occurring in typhoid may be very difficult to tell from a concurrent appendicitis.

Extra-uterine pregnancy is to be recognized by the existence of the usual subjective signs of pregnancy, by vaginal examination, and by the absence of inflammatory symptoms prior to the rupture. (Annals of Surg., Mar., '98.)

Etiology and General Characteristics.—Young adults, especially males, constitute the majority of cases. Appendicitis occurs at all ages, however, though very rarely during infancy.

Among 489 cases found in literature 392 were males and 97 females. Pravaz (Thèse de Lyon, '88).

Of 90 cases, 73 per cent. were under thirty years of age; 76 per cent. were males, 24 per cent. females. Bigelow (Vis Medicatrix, Oct., '91).

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Case of appendicitis in a child 1 year old. The attack began with vomiting and pain. Frequent retching and crying continued throughout the sickness. The temperature ranged form 100° to 102° F. Pulse very rapid. Repeated palpation failed to discover a tumor and to locate the pain or tenderness. Distension of the abdomen, slight at first, became extreme, but no flatus was passed. The vomitus became brown. Diagnosis of intestinal obstruction confirmed by consultant. Abdomen opened and a perforated appendix found. Death in eight hours. F. W. Taylor (Boston Med. and Surg. Jour., May 20, '97).

Report of 517 cases seen in the leading Montreal hospitals showing the condition to be most common between the ages of twenty and thirty, and to occur twice as often in males as in females. G. A. Armstrong (Lancet, Sept. 18, '97).

Study of 80 cases treated by Broca;

70 not previously published. Proportion of boys to girls, 58 to 21; 5 were aged between 2 and 5, 25 between 5 and 10, and 41 between 10 and 15 years. Mlle. Gordon (Thèse de Paris, No. 101, '97).

Heredity seems to act as a predisposing factor in connection with an arthritic diathesis.

Rheumatism may act as an etiological agent, the constitutional intoxication manifesting itself by an inflammation of lymphoid tissue. Sutherland (London Lancet, Aug. 24, '95).

Heredity lies in a tendency to the development of uricacidæmia and uricæmia. Ernest Frazer (Brit. Med. Jour., July 27, '95).

Heredity, as presented in appendicitis, is similar to that occurring in connection with other inflammatory disorders of lymphoid tissues. Four cases of appendicitis in one family. Armstrong Atkinson (Brit. Med. Jour., June 29, '95).

Four cases in one family. Henry Taylor (Brit. Med. Jour., Oct. 19, '95).

Literature of '96-'97-'98.

Three cases in which appendicitis seemed to follow family lines. The first patient had lost a daughter one year before from peritonitis, resulting from appendicitis. She had had three previous attacks. The second, a child, 11 years of age, had a first cousin, 12 years of age, operated on for appendicitis. The third, a boy aged 13 years, had lost an elder brother, who had died of general peritonitis. A gangrenous appendix also found in this case. W. T. Smith (Med. Record, Sept. 12, '96).

The local inflammation may be caused by the intrusion of:—

1. Micro-organisms, specific and non-specific, of which constipation, dietetic indiscretions; neighboring catarrhal, typhoid, and tubercular processes; constriction, torsion, or strain are the primary etiological factors. Cases due to actinomycosis are occasionally observed.

Traumatism, blows upon the abdomen, etc., sometimes produce inflammation of the appendix.

Appendicitis is due, in America, to two of our natural failings,—those of eating too much and chewing too little, the result of which is constipation. Lange (N. Y. Med. Jour., June 6, '91).

Fatal case in injudiciously fed child 2¼ years old. Churton (Brit. Med. Jour., Jan. 26, '95).

The great frequency of this affection is due to the fact that the appendix is a functionless structure of low vitality, removed from direct fæcal current; bacterium coli commune is always present and is capable of great virulence when constriction of the appendix or lesions of its mucous membrane or other coats are present. J. William White (Therapeutic Gazette, p. 385, '94; Brit. Med. Jour., Feb. 9, '95).

Next to the ileum, the cæcum and the vermiform appendix are the most frequently altered by ulceration and gangrene in typhoid fever. Schell (N. Y. Med. Jour., April 20, '95).

Two cases of perityphlitic actinomycosis. Lanz (Corres. f. Schweizer Aerzte, May 15, June 1, '92).

Literature of '96-'97-'98.

Case of appendicitis due to traumatism, the patient, a boy of 16 years, having been struck in the right iliac region by the handle of a push-cart. Distinct tumor in the right iliac region, marked tenderness most acute over McBurney's point, and some pyrexia. The tip of the appendix found gangrenous. W. S. Coley (Med. Record, Feb. 15, '96).

Case of strangulation of the appendix in an infant 6 weeks old; appendix successfully removed. Drew (London Lancet, May 24, '97).

A strain may apparently originate an attack,—a point of medico-legal importance. An already damaged appendix is especially susceptible to such injury. Many acute attacks of appendicitis commence during sleep. Rutherford Morison (Edinburgh Med. Jour., Mar., Apr., May, '97).

General prevalence of catarrhal condi-

tions of the bowels, perhaps as an accompaniment or result of grip, is responsible for a large part of the general increase in prevalence of appendicitis.

The disease is of growing medico-legal importance, as many cases are of traumatic origin, and may therefore give rise to proper suits for damage or valid claims against accident-insurance companies. W. B. Small (Med. Record, Sept. 10, '98).

2. Irritating fæcal matter, which frequently forms hard egg-shaped fæcal concretions of various sizes; foreign bodies, — cherry-stones, orange-seeds, buttons, spicules of bone, etc.,—which penetrate into the interior of the appendix through deficient action of a valve which usually closes its opening, or on account of excessive patency of the latter. Grape-seeds were at one time thought to play an important rôle as etiological factors, but a painstaking investigation by Edmund Andrews showed that this was not based on facts. Indeed, it is quite probable that foreign bodies play a very small part in the production of attacks of appendicitis, hardened fæcal masses being excluded.

Study of four hundred specimens of the vermiform appendix. Fæcal stones found thirty-eight times; equally frequent in both sexes. The appendix undergoes a process of retrogression, in length, in its histological structure, and spontaneous obliteration of the lumen. The average length is eight and one-fourth centimetres; greatest length attained between the ages of 10 and 30; the shorter the appendix, the more frequent the obliteration. Ribbert (Virchow's Archiv, B. 132, H. 1, '93).

Of one hundred and forty-six adult cases recorded by Matterstock sixty-three had fæcal concretions and but nine had foreign bodies. J. O. Affleck (Int. Med. Mag., Oct., '93).

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Two hundred cases of appendicitis examined for seeds. In one case a few strawberry-seeds found, while none of the others contained more than a fæcal concretion in the form of a foreign body. Gallant (Med. Record, Feb. 15, '96).

Case in which a pin was found in the appendix, having been there a year without producing trouble, until lighted up by a blow. Sudden fall of the temperature to 97°, intense pain whenever anything started up the peristaltic movement. D. C. Moriarta (N. Y. Med. Jour., Oct. 24, '96).

Investigation as to the question of the part played by grape-seeds in the etiology of appendicitis, based upon all cases found in the Chicago hospitals during a period of fourteen years: 3709 in number. Instead of finding that a large number of cases had occurred during August, September, October, and November,—the grape-eating months,—it was actually found that a smaller number of cases had been observed during these months each year. Edmund Andrews (Jour. Amer. Med. Assoc., vol. xxvii, p. 1193, '96).

Appendicitis caused by a full-sized *Ascaris lumbricoides* in the appendix. J. Price (Va. Med. Semimonthly, Jan. 29, '98).

General Pathogenesis.—The vermiform appendix is a glandular organ presenting a certain analogy to the tonsils and liable, as well, to follicular, mucous, submucous, infectious, exudative, and ulcerative disorders.

The appendix is rather a glandular organ than an organ of absorption; its mucous glands and lymphoid tissue are greatly developed. In the angle formed by the appendix, the cæcum, and the small intestine there is a lymphatic ganglion not before described. Clado (Bull. de la Soc. de Biol., Jan. 30, '92).

Case of recurrent appendicitis in a child, in which a caseous lymphatic gland was found adhering to the cæcum. G. A. Wright (Med. Chronicle, Sept., '94).

The follicles are invariably affected, as well as the mucous glands. Pilliet

and Coste (Bull. de la Soc. Anat., Jan., '95).

Two cases in which the destructive changes began in the tubercular glands, the ulceration allowing the infectious elements to reach the lymphadenoid tissue beneath. Walker Shell (N. Y. Med. Jour., Apr. 20, '95).

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Appendicitis is an infectious disease of the appendix, in the same way as follicular angina is to the tonsils or dysentery to the colon. In Moscow, during the spring, summer, and autumn of last year, the number of cases increased to four or five times the average of the past ten years. Goluboff (Berliner klin. Woch., Jan. 4, '97).

Like the tonsil, the appendix abounds in closed adenoid follicles, and, like tonsillitis, appendicitis recurs in patients who are predisposed to it. Since tonsillitis is one of the most frequent manifestations of influenza due to a change in the seasons, it is not to be wondered at that appendicitis should occur under the same conditions. Three illustrative cases. P. Merklen (Univ. Med. Jour., Apr., '97).

An appendicular inflammatory process is almost invariably started by the bacillus coli communis. In a certain proportion of cases other micro-organisms, especially the staphylococcus pyogenes and streptococcus, are also found.

The bacterium coli commune found in all cases studied; generally alone, but sometimes with the staphylococcus pyogenes. Adenot (Bull. de la Soc. de Biol., Nov. 7, '91).

Review of twenty-four cases in which bacteriological studies have been made. The bacillus coli communis was found in the exudate of all. In only two was it associated with others,—once with the bacillus pyogenes fœtidus and once with a streptococcus. In ten personal cases the bacillus coli communis was obtained in pure cultures; in one it was combined with the streptococcus pyogenes. The colon bacillus found in connection with various pathological processes other than appendicitis, but nearly always associated with some lesion of the intestinal wall. Hodenpyl (N. Y. Med. Jour., Dec. 30, '93).

Bacteriological study of eight cases, seven of which gave pure cultures of the bacterium coli commune, while in the eighth the bacillus pyogenes fœtidus was also present. In one instance the tip of the appendix was adherent to the cæcum, and the cultures were obtained from the patch of lymph upon the latter at this spot, suggesting that the germs had penetrated the cæcum and infected the appendix from outside in this way. G. R. Fowler (N. Y. Med. Jour., Oct. 14, '93).

The bacteriological examination of pus from a case of appendicitis gave bacilli coli, staphylococcus aureus, bacillus subtilis, and lactic bacilli. Jalaguier (La Semaine Méd., June 8, '92).

Case complicated with inguinal hernia, in which the pus in the sac surrounding the cæcum was found to contain a motile bacillus of the proteus group, showing, when inoculated, highly pathogenic characters. Ohlmacher (Cleveland Med. Gaz., Sept., '94).

Literature of '96-'97-'98.

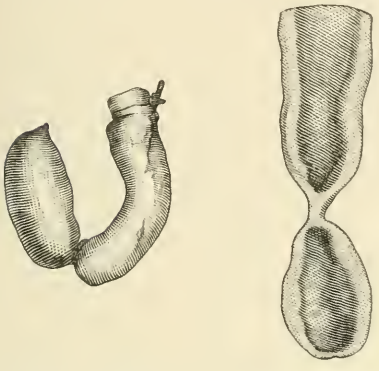
Catarrhal inflammation and the formation of concretions the primary causes of appendicitis. Occlusion of the lumen is followed by secondary bacterial invasion. Dieulafoy (Bull. de l'Acad. de Méd., No. 10, '96).

Appendicitis is not, as thought by Dieulafoy, the result of the transformation of the appendicular canal into a closed cavity. Numerous cases showing that the transformation of the appendicular into a closed cavity is but one of the results of appendicitis. (See woodcuts.) Brun (La Presse Méd., Aug. 6, '97).

Experiments in rabbits showing that any obstruction of the mouth of the appendix is sufficient to cause appendicitis. The bacillus coli found in pure culture remain inoffensive until obstruction of the opening causes their multiplication. Roger and Josué (Jour. des Practiciens, Feb. 8, '96).

The coli bacillus, undoubtedly, may

alone exist in the exudate. In 20 cases examined, all purulent, 10 were associated with other bacteria, the most important of which in 6 cases was the streptococcus. It is probable that in appendicitis the coli bacillus is aided by other bacteria, which it soon outnumbers and destroys. Achard and



U-shaped appendix, with central constriction. Lower segment found empty. (*Brun.*)

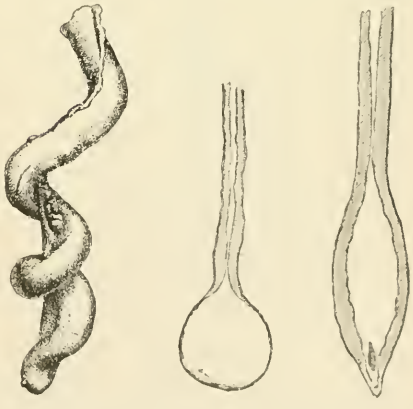
Broca (Gaz. Heb. de Méd. et de Chir., Apr. 1, '97).

Bacteriological investigations emphasizing the fact that the presence of the streptococcus is usually attended with symptoms of the severest type. J. J. Curry (Boston Med. and Surg. Jour., Apr. 22, '97).

New method of studying the removed appendix. Within a few hours after removal the appendix should be distended with 95-per-cent. alcohol, through a conical nozzle of a small syringe tied tightly into its cut end by a ligature, which is tightened as the syringe is withdrawn. The distended organ is then immersed twenty-four hours or more in alcohol of the same strength. It is then ready for section. If it is sliced centrally from end to end, its interior will be a revelation to the surgeon. Whereas the outside may preserve the cylindrical form of a normal appendix, and may give little or no evidence of inflammation, the interior (if the patient has had one or more attacks) will show one or several of the conditions illustrated by the annexed cuts. Robert Abbe (Med. Record, July 10, '97).

Histological study of the various forms of follicular appendicitis: 1. Recurrent appendicitis has its principal location in the follicles. 2. Fæcal concretions, which are frequently found in appendicitis, are a result of the appendicitis; they are not formed from the fæces and contain no food-remnants, they are derived from the mucous secretion of Lieberkühn's glands; the latter are hypertrophied from their activity. 3. The obliteration of the vermiform process is a pathological process which follows follicular appendicitis. 4. Gangrenous appendicitis in which all the coats of the organ are destroyed simultaneously is fortunately of rare occurrence. Pilliet (Le Prog. Méd., Jan. 29, '98).

Appendicitis should be regarded as an inflammation of the vermiform process due to infection. The streptococcus lanceolatus, the bacillus pyogenes, the bacillus subtilis, the staphylococci, the bacterium coli commune may each be responsible for the infection, but in the large majority of instances the culture will be found to contain either the bac-



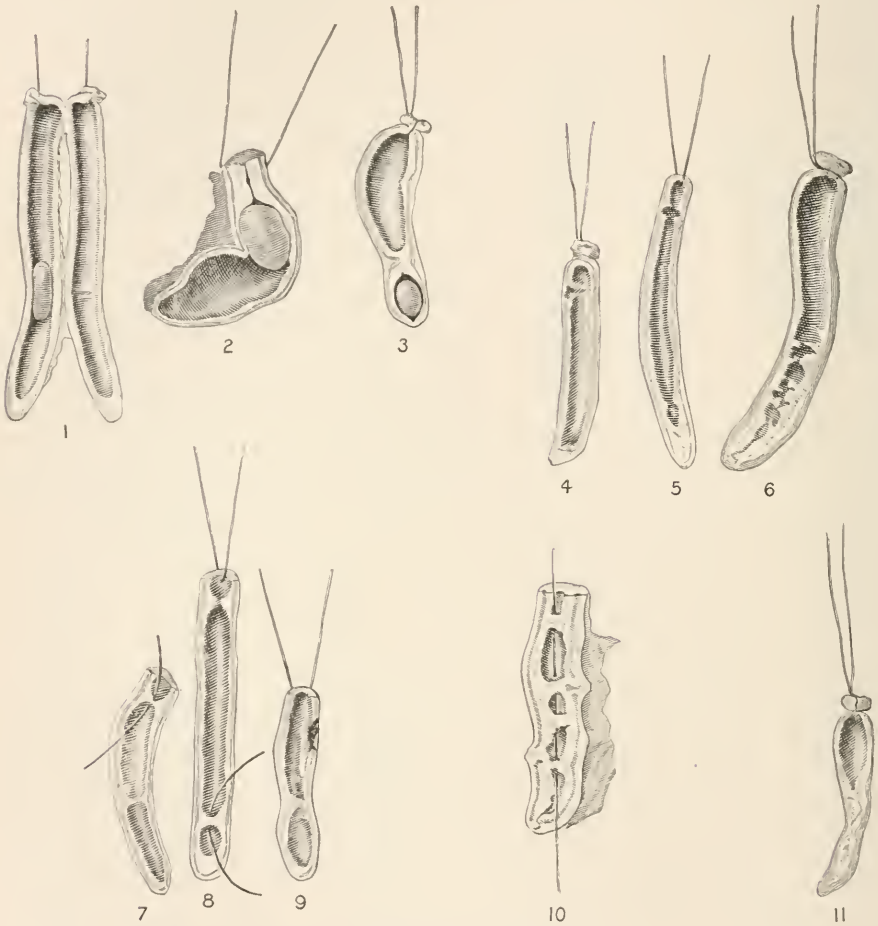
Cystic appendices with thin walls and filled with sero-purulent fluid, but having open, though small, canals. (*Brun.*)

terium coli commune alone or in conjunction with one of the other aforementioned organisms. It is a well-known fact that these organisms may exist in the intestinal tract without provoking infection, but that when there is any circulatory disturbance or injury to the mucous membrane their virulence in-

creases; and infection is apt to follow. Carl Beck (N. Y. Med. Jour., Nov. 19, '98).

There are at least four distinct varieties of appendicitis obliterans: an exudative variety; a variety characterized by mu-

ized peritonitis; endarteritis and periarteritis are almost constant phenomena in the disease. The vermiform appendix, in health, is distinctly muscular; in disease the muscles often hypertrophy. J. F. Binnie (Annals of Surg., May, '98).



Figs. 1, 2, and 3.—A fæcal concretion blocking the canal.
Figs. 4, 5, and 6.—Interior ulcerations.
Figs. 7, 8, and 9.—Cicatricial strictures, often of pin-hole aperture only.
Fig. 10.—Multiple strictures with intermediate pockets, containing suppurating and catarrhal products and confined by greatly hypertrophied muscular and mucous coats.
Fig. 11.—Partial obliterating appendicitis.
These five varieties are subject to minute variations. (*Robert Abbe.*)

cesal hyperplasia, and sclerosis; a variety characterized by submucous hypertrophy; a reparative variety. In all varieties there may be and generally is local-

Appendicitis almost always precedes an attack of perityphlitis or paratyphlitis.

Records of one hundred post-mortem examinations, 91 per cent. of which showed that the disease had started in the vermiform appendix. Primary perforation of the cæcum was observed in only 9 per cent. of the cases. Einhorn (Münchener med. Woch., Nos. 7 and 8, '91).

In three hundred and twenty-four cases the appendix was found to be the seat of the disease two hundred and eighty-two times. The importance of the appendix as a starting-point for disease is beyond dispute. Hartley (N. Y. Med. Jour., June 25, '92).

The affection may start either in the cæcum or the appendix, but with marked predilection for the latter. Herman Mynter (Deutsche med. Woch., Apr., '91).

Post-mortem records at Munich fully bear out the generally received idea that the appendix is primarily involved. Haenel (Münchener med. Woch., Mar. 26, '95).

Pathology of Various Forms.—The simple catarrhal form is usually caused by constipation or indiscretion in diet, in which the inflammatory process, after passing through an acute stage, including more or less epithelial desquamation, excoriation, etc., and involving the mucosa, submucosa, and the serous layer and the overlying area of peritoneum, gradually recedes. The appendix remains very vascular and functionally weakened, and is subject to renewed attacks of inflammation.

The ulcerative form, in which the inflammation is usually produced by fæcal concretions or foreign bodies, gradually proceeds to ulceration. An opening becomes formed near the apex of the organ and the fæcal concretion or foreign body escapes, with the septic discharges formed, into the abdominal cavity.

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The majority of primary attacks of appendicitis occur through an eroded mucous membrane, caused by masses of fæcal matter, rarely by a foreign body. Fæcal matter is introduced into the lumen of the appendix by contractions of the cæcum. The expulsive force of the appendix is not sufficient to expel it, and hence it remains to irritate the mucous layer, at first merely by its presence. The slight muscular movements of the appendix tend to mold the mass into a round or oblong shape. This mass is augmented by the natural secretions of the mucous membrane of the appendix and by further accessions of fæcal matter from the cæcum. Gradually the concretion increases in size until it irritates by causing pressure against the walls of the organ. This is followed by a decided erosion of the mucous membrane, and this by an invasion of the micro-organisms which are always present in fæcal matter. They proliferate, and the inflammatory troubles then begin. In a few cases the increased secretion of the mucous layer may cause partial liquefaction of the fæcal concretion, which may be expelled. In the majority of cases, however, the concretion remains in the lumen, where it is found to act as an exciting cause of further inflammatory trouble. J. B. Deaver (Amer. Jour. Med. Sciences, Aug., '97).

Anything that could remove the epithelial lining from the mucous membrane of the appendix might be the starting-point of the mischief. G. A. Armstrong (Lancet, Sept. 18, '97).

Development of disease of the appendix: A catarrhal inflammation of the lining mucous membrane. Irregular narrowing of the calibre, with hypertrophy of the mucous and muscular coats. Strictures. Imprisoned food, desquamated epithelium, and pus, forming concretions. Obstructions at the stricture, distension, perforation, and abscess. This includes the great majority of cases, but does not exclude appreciation of the rarer ones resulting from simple flexion of the organ or those resulting from internal ulceration. Robert Abbe (Med. Record, July 10, '97).

In one hundred and forty-six cases collected by Matterstock perforation was found to have occurred one hundred and thirty-two times.

The complications following perforation vary. Normally the peritoneum completely surrounds the appendix and the cæcum, and a localized peritonitis and a perityphlitic abscess necessarily follow.

As shown by Treves, the cæcum is, with rare exceptions, completely surrounded by peritoneum from its ileocæcal value to its apex. Hence inflammations and perforations of the cæcum without the involvement of the peritoneum are physical impossibilities in the vast majority of cases. The normal appendix is always found completely surrounded by peritoneum and having a distinct mesentery, by which it is attached to the under layer of the mesentery of the ileum. Ransohoff (Jour. Amer. Med. Assoc., July 14, '88).

If, however, through previous local inflammation, close adhesions have united the appendix and the peritoneum, both organs are perforated simultaneously, and the appendical contents may pass entirely through the peritoneal coats. This gives rise to an extraperitoneal abscess, which may open externally above Poupart's ligament or within the abdomen into the small intestine, the bladder, the vagina or the rectum, the portal vein, the iliac artery, etc.

Case of areolar abscess about the subhepatic veins as a result of appendicitis. The bacillus coli was found in pus. Achard (Gaz. des Hôp., Nov. 20, '95).

Hepatic complications are most frequent in youth and in latent forms of appendicitis. Infection occurs most frequently through the portal system, the lymphatics playing but secondary rôle. Berthelin (Thèse de Paris, '95).

Prevesical abscess due to appendicitis. Tuffier (La Semaine Méd., Dec. 12, '94).

Case in which perinephritic abscess occurred as complication. Atherton (Canadian Pract., Mar., '95).

Case in which death occurred from rupture of common iliac vein. J. G. Lewis (N. Y. Med. Record, Oct. 13, '94).

Pleurisy, due to propagation of the inflammation through the retroperitoneal cellular tissue, or through the lymphatic system, is an occasional complication, but often passes unperceived. It is almost invariably on the right side, and is rarely bilateral.

Pleurisy observed 34 times in 89 cases. In the 34 cases but 1 presented the complication on the left side. When bilateral pleurisy does present itself the right pleura is the first affected and contains the largest effusion. Wolbrecht (Thèse de Lyon, '93).

Out of 45 cases recorded 3 were of the dry form, in 29 the effusion was serous, while in 13 the liquid was purulent, with marked dyspnœa and intense fever. The prognosis of the appendicitis is only affected by the pyæmic form of pleurisy, the serous form frequently disappearing of its own accord. The lungs should be carefully watched in all cases, therefore, lest the aggravated pleurisy intervene to seriously compromise the result. Croizet (Thèse de Lyon, '93).

If there is no adhesion between the appendix and the peritoneum suppurative peritonitis is produced, and this process usually gives rise to a protective plastic exudation, which causes the surrounding loops of small intestine to adhere together and inclose the secondary abscess, thus temporarily protecting the surrounding parts.

If, however, the plastic inflammation does not induce protective adhesion between the intestinal loops, the septic material invades the whole peritoneal cavity, and gives rise to diffuse and fatal peritonitis.

Prognosis.—Death may occur very early, especially in children, who are also more liable to peritonitis than adults. The danger of death is greater in men than in women.

Among thirty cases in the Sabbatsberg Hospital (1) appendicitis produced 1.1 per cent. of the total mortality; (2) it was twice as fatal to men as to women; (3) the ages of greatest mortality were between ten and thirty years (the average being 4.2 per cent.), while most cases occurred at these ages; (4) there were no cases in men over forty-five years or in women over fifty-four years. Wallis (Hygiea, B. 54, No. 6).

No positive prognosis can usually be given in the first twelve hours. Where there is no exhaustion, no general sepsis, no debility from long abstinence from food, no prolonged vomiting, the prognosis is good. If we wait for "strong evidence" of perforation,—abscess, general peritonitis, rapid and weak pulse, anxious respiration, distension of abdomen to the operation,—the patient will not recover. Joseph Price (Buffalo Med. and Surg. Jour., Dec., '91).

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It is in the first twenty-four hours from the beginning of the attack that we can decide not only as to the diagnosis, but as to the probable course and result of the case. If in five or six hours there is no increase in urgency, the patient is not in immediate danger, kept at perfect rest in bed; if in twelve hours there is still no increase in the severity of the symptoms, the patient should soon begin to improve. If the urgency of the case has steadily increased in twelve hours from the time when the diagnosis was made, an operation will probably be called for. After two attacks a patient is sure to have a third, and each attack renders operation more difficult and dangerous. All the advantages lie with operation between the attacks. In an operation during an acute attack the prognosis is worse. McBurney (Med. News, No. 24, '96).

The presence of shock, if undoubted, is a very grave symptom, generally indicating perforation. On the contrary, the most deadly attacks often occur without it. While a rapid pulse and high temperature favor the destructive process, their absence is no assurance of recovery. Opinion of several leading American surgeons. Crutcher (Inter. Jour. of Surgery, Jan., '97).

Conclusions based on 213 personal cases:—

1. Cases with early fever (104° F.), with defervescence on third or fourth day, recovered rapidly.

2. Similar onset, but more prolonged fever, with fall of temperature about the fifth day to 102° F. Of 14 cases, 3 were operated on for abscess and all cured.

3. Temperature after fifth day still over 102° F.: infection virulent and prognosis unfavorable. Of 11 such cases 2 died, 2 were cured without operation, 4 were operated on, and 3 recovered after long illness due to perforation into the bowel.

4. Recurrence of fever after early defervescence. Of 6 such cases 4 were operated on; 1 died from peritonitis.

5. General peritonitis, with serious infection, low temperature. In these cases the state of the pulse gives indications as to the severity of the disease. J. Rotter (Centralb. f. Chir., Oct. 24, '96).

The gravity of appendicitis is considerably increased when that disease is complicated by pregnancy. One author estimates the mortality of appendicitis during pregnancy at 31.2 per cent. and that of appendicitis in general at 12.8. Bué (La Méd. Mod., Mar. 12, '98).

Reference made to 32 cases of appendicitis during and after pregnancy, 4 of which were personal. In the 32 cases there were 10 deaths, a percentage of 31, which is much higher than that of Armstrong in his series of 517 cases, with a mortality of 12.8 per cent. The only complication of importance in appendicitis occurring during pregnancy is abortion, noted in 40 per cent.; this accounts for fact that in half the 32 cases the children died. Appendicitis during pregnancy should be treated like ordinary appendicitis. Vinay (Lyon Méd., Jan. 2, '98).

Improved methods of treatment, especially the early evacuation of pus and a better understanding of the symptoms,

have brought the mortality down from 30 per cent. to 8 per cent.

The prognosis as to day of death: without operation, in perforative cases, one-third die between the second and fifth day. In a series of one hundred and seventy-six cases: eight cases died on the second day; twenty-eight cases died in first three days; forty-six cases died in first four days; sixty cases died in first five days. Fitz (Buffalo Med. and Surg. Jour., Dec., '91).

Statistics of four hundred and fifty reported operations during the interval between the attacks showing eight deaths, which would give a mortality percentage of 1.77. If all cases were reported, 5 or 6 per cent. would be a fairer estimate. We need more carefully recorded cases. Bull (N. Y. Med. Record, Mar. 31, '94).

Mortality less than 8 per cent. during first week and over 17 per cent. during second week in operated cases. Steele (Mathews's Med. Quarterly, Apr., '95).

In the aged and infirm there is but little hope from operation. Quénu (La Semaine Méd., June 8, '92).

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If operation is performed within the first twenty-four hours, the prognosis is good and recovery will follow in most cases. If opium is used the prognosis is bad, as it masks symptoms, delays operation, and constipates the bowels. Many recover without an operation. Many recover, and then die in the second or third attack. E. M. Pond (Med. Record, Apr. 23, '98).

Seven per cent. of all cases treated by other than surgical means when first attacked will die, and the mortality of all cases treated in this way which pass to a second attack is 14 per cent. On the other hand, chances are three to one against a recurrence. Operation by experts is practically without mortality; but those who are inexperienced in abdominal surgery take great risks. Every case requires consultation. M. C. McCannon (Med. and Surg. Bull., Aug. 9, '98).

The surgical death-rate in acute and chronic appendiceal cases, without abscess, is a fraction of 1 per cent. at the hands of several American surgeons, and it is believed from classified data that the eventual death-rate in appendicitis cannot be much less than twenty-five per cent. The loss of time and sufferings are also much less under proper surgical treatment than under the best medical treatment. Robert T. Morris (Med. Times, Apr., '98).

Seven hundred and fifty cases of appendicitis personally observed show that out of 464 acute cases, 284 were operated on, with 63 deaths, giving a mortality of 21 per cent.; 149 cases recovered without operation, and 31 cases were moribund when first seen by the surgeon.

One hundred and fifty-one cases were operated on in the "interval" (*i.e.*, after an acute attack had subsided, or between two acute attacks in chronic cases). All of these recovered.

Out of 180 cases treated medically, 31 died, giving a mortality of only 17 per cent., as against 21 per cent. in the acute cases operated on by the authors. But it must be observed that some of the 31 cases might have recovered by operation; on the other hand, it may be argued that, of the 63 fatal cases operated on, some might have recovered under medical treatment only. If all cases were seen by the surgeon on the first or second day, every fatal case would be operated on at a time most favorable for cure.

Conclusion is that the safety and efficacy of the "interval" operation make it desirable to get the patient through the acute attack, if possible, without operation. Severe cases should, however, not be allowed to run on in the false hope that an operation can be avoided. M. H. Richardson and G. W. Brewster (Boston Med. and Surg. Jour., July 14, '98).

The more frequent complications that may thwart all plans of treatment even in the presence of the most careful technique: 1. General septic peritonitis. 2. Intestinal obstruction, due to kinking of the recently separated intestine or to adventitious bands. 3. Retroperitoneal abscess. 4. Fæcal fistula. 5. Multiple abscess of the liver. 6. Gangrene of the cæcum. 7. Phlebitis of the femoral vein. 8. Communication of the abscess with the rectum, vagina, or bladder. 9. Ven-

tral hernia. 10. Fatal hæmorrhage. 11. Parotiditis. 12. Empyema. 13. Pericarditis. R. A. Sterling (Intercol. Med. Jour. of Australasia, Aug. 20, '98).

Cases of simple catarrhal appendicitis with adhesive peritonitis almost invariably get well.

Cases in which extraperitoneal perforation occurs generally recover, unless the abscess opens into the bladder or the pleura, when recovery is doubtful.

Cases in which invasion of the general peritoneal cavity by septic material has occurred usually end fatally.

Surgery has sometimes been successful even where there has been (*a*) general suppurative peritonitis; (*b*) septic paresis of the intestines; (*c*) multiple abscesses in the peritoneal cavity. Price (Buffalo Med. and Surg. Jour., Dec., '91).

Diffuse peritonitis the cause of 70 per cent. of the deaths from appendicitis. Haenel (Münchener med. Woch., Mar. 26, '95).

Recovery in a case of profuse septic peritonitis. The protecting wall of the inflammatory adhesion was incomplete, and the septic process extended to the liver and the whole right abdominal cavity. The pelvis was filled with purulent fluid and fæces. Appendix gangrenous and left in. Kakeles (N. Y. Med. Jour., July 6, '95).

Recovery in a case of acute gangrenous appendicitis with general suppurative peritonitis. Parker Syms (N. Y. Med. Jour., May 18, '95).

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Case of fulminating appendicitis. The patient, a girl aged 25 years, was operated upon at 5 P.M., twenty-four hours from the beginning of the active symptoms. The peritoneal cavity was found to contain about two quarts of pus, the intestines being coated throughout with thick layers of lymph. Although at first the prognosis was exceedingly bad, the patient was convalescent at the time the report was published. McCosh (Annals of Surg., Feb., '97).

Gradual remission of the active symptoms, especially in the size of the tumor, is a favorable sign. The contrary is the case when the remission is sudden.

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Pain.—If violent, sudden, and persistent, it indicates probable seriousness of the attack, but nothing as to the natural defenses for limiting infection. On the other hand, absence of pain is undecisive between the gangrene and resolution.

Pulse and Temperature.—While a rapid pulse and high temperature favor the destructive process, their absence affords no assurance of recovery. Referring to this, Tyson remarks that too much stress cannot be laid upon the fact that there may be gangrenous appendicitis in the presence of normal temperature.

Shock.—The presence of shock, if undoubted, is a very grave symptom, generally indicating perforation. On the other hand, the most deadly attacks often occur without it.

Sensitiveness.—If persistent and highly developed, it generally indicates destructive inflammation, but gives no clue concerning the limitations of infection.

The Expression.—This is of material value before the development of grave conditions.

Perforation.—This can no more be foretold than the perforation of the intestine in typhoid fever or the rupture of an aneurism. Howard Crutcher (Canada Lancet, May, '98).

Tendency to recurrence is one of the marked features of appendicitis. The danger to life increases with each successive attack.

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Study of 104 cases of recurring appendicitis in which operation between the attacks was performed, without a death. Examination of the appendices removed showed that in not one case had the organ become normal after the attack. Every specimen showed inflammatory conditions. Clinical symptoms are not certain, and one cannot positively determine from them the stage which the in-

flammation has reached nor the variety to which it belongs. Hermann Kümmell (Berliner klin. Woch., Apr. 11, '98).

Medical Treatment.—Medical treatment is indicated when the signs of abscess formation are not present and even then only during the incipient stage of the disease.

Saline aperient, sulphate of magnesia in small doses every two or three hours, combined with copious warm enemata or irrigation of the bowels with Hegar's funnel syringe, the patient being in the knee-chest position, are of value to reduce the infectious secretions and discharges.

Early employment of salines is useful for the removal of toxins and on account of the derivative action. S. C. Gordon (Amer. Jour. Med. Sciences, Jan., '93).

For distension salines are of no use except very early; in appendicitis they are decidedly injurious. Richardson (Amer. Jour. Med. Sciences, Jan., '94).

Purgatives are to be deprecated or utilized only when the local symptoms, the dangers of perforation and of generalized peritonitis, are less. Castor-oil in teaspoonful doses enough to begin on. Le Gendre, Sevestre, Moizard, Mathieu (La Semaine Méd., Nov. 28, '94).

For every case of appendicitis treated, at least five met with showing symptoms so closely resembling those of inflammation of the appendix that it was impossible to say that appendicitis did not exist until free purgation had been used.

In simple cases the cautious use of enemata to remove irritating intestinal contents to be preferred. Later on they tend to break adhesions by peristalsis, open perforative ulcers, and spread the infection. Schell (N. Y. Med. Jour., Apr. 20, '95).

Three cases in which rectal injections of large doses of glycerin were advantageously used. Joubert (Univ. Med. Jour., June, '95).

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The diagnosis of pain in the abdomen, accompanied by fever, should be assisted by giving a purgative; in a number of cases this will lead to a rapid and complete cure. Mordecai Price (Med. and Surg. Reporter, Jan. 2, '97).

When pus is present, also when the symptoms are severe from the outset, and in relapsing cases without tumefaction one should operate. If operation is not performed, rest in bed, quiet, ice-bags, hot turpentine stupes, calomel,—the dose followed in six hours by magnesium sulphate,—or castor-oil alone are indicated. Diet should be light: broths with white of egg, milk in small quantities. No opium. Ninety per cent. of all first cases treated thus will recover, at least temporarily. M. C. McCannon (Medical and Surgical Bull., Aug. 9, '98).

Out of 51 cases under personal supervision, 44 were successfully treated without operation. The method consists of at first giving cathartic doses of castor-oil with olive-oil, followed with hot water, until the bowels are thoroughly emptied. This is followed by enemas of glycerin and olive-oil. Flaxseed poultices soaked in olive-oil are applied to the abdomen. The diet is restricted to very light, easily-digested foods. To prevent a return of the inflammatory process, after the original treatment $^1/_2$ ounce of olive-oil is given, followed by a glass of hot water before each meal for several weeks. Terry (Medical Times; Canada Lancet, Mar., '98).

Absolute rest is imperative, and only liquid food should be permitted.

For the pain, hot fomentations or poultices or the ice-bag may be applied over the cæcal region. If the ice-bag is used it should be shifted occasionally or removed at intervals.

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It is bad practice to apply blisters and like remedies over the region of the appendix, when treating the disease, because, if operative measures are subsequently adopted, there will be more

probability of suppuration and sloughing in the wound. O. W. Braymer (Jour. Amer. Med. Assoc., Apr. 23, '98).

Two cases of appendicitis in both of which undiluted ichthyol was painted over the ileo-cæcal region twice daily and ice-bags applied. In the graver of the two ichthalbin was exhibited internally as well. Both patients, when discharged, had no tenderness on pressure over the ileo-cæcal region. Action of the ichthalbin on the bowels was very beneficial. Fuchtenbusch (Amer. Med.-Surg. Bull., Dec. 25, '98).

Opium was at one time highly recommended, but it is now regarded by many clinicians as a dangerous remedy. It masks the symptoms, and thereby tends to compromise the chances of operative procedures through delay; it locks the intestines and thereby prevents the expulsion of infectious discharges.

Opium, by holding the bowels quiet, allows the pus to become incapsulated by adhesions. Kottmann (Corres. f. Schweizer Aerzte, July, '92).

Morphine only when absolutely unavoidable; arrests secretory functions. Codeine is equally efficacious in some cases. Beverly Robinson (N. Y. Med. Record, Sept. 14, '95).

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Opium should seldom, or never, be given in the earlier stages, lest it mask the important symptoms which act as operative guides.

If opium has been given, it will be advisable for the surgeon to reserve his opinion, and if on withholding the sedative for a few hours the pulse has increased in frequency, and anxiety of countenance has declared itself, operation will be required. Mayo Robson (Brit. Med. Jour., Dec. 19, '96).

Opium paralyzes the nervous tone and resistance to microbic proliferation, and masks symptoms. It is doubtful whether it has ever checked peritonitis. Old-fashioned laudanum poultice is sufficient in parietal cases. Surgical measures are required only in one-third of the cases and should always be preceded by medical treatment. Talamon (Méd. Mod., No. 31, '97).

Opium is the patient's greatest enemy: it masks the symptoms and renders diagnosis exceedingly difficult. J. T. Johnson (Med. News, Nov. 28, '96).

Proper expectant treatment: Put the patient to bed and keep him there. Apply over the whole iliac region a soap "poultice," consisting of a thick layer of green soap, spread on a single layer of muslin or lint. Over this apply an ice-bag or ice-coil. Relieve bowels by soap-and-water enema. Keep the stomach at rest while vomiting exists. Restrict the patient to milk or clear broths. Note the temperature, pulse, and respirations every four hours. Give no drugs. Never give opium or morphine in cases of appendicitis, except in cases of abdominal shock from rupture of appendix or abscess. Syms (N. Y. Med. Jour., May 15, '97).

Fifteen cases of appendicitis in private practice, all of whom have recovered without operation. Patients were all put to bed and kept quiet. All food was withheld for twenty-four or forty-eight hours—even water was given sparingly. A saturated solution of Epsom salt in peppermint-water was given in teaspoonful doses, one in three hours, until one or two movements of the bowels were obtained in twenty-four hours. When stomach was too irritable to retain the Epsom salts, calomel was given in divided doses until there were one or two movements of the bowels. No opiates were employed. When patient began to eat, food was given cautiously: a teaspoonful of milk and lime-water, or small quantity of beef-juice or some animal broth, once in two or three hours. Turpentine stupes and the hot-water bags are of use in overcoming pain. Opiates are to be avoided. Many cases, however, are surgical from the beginning. The result of medical treatment is doubtful, if within the first twenty-four hours after the patient is seen, or after the bowels have been sufficiently moved, there has not been a decided improvement in pain, vomiting, and fever. H. B. Allyn (Ther. Gaz., Jan. 15, '99).

Opium is sometimes used in light cases where we are certain that no aggravation of the condition present is to take place. But this no one can foretell with certainty, and it seems best to protect the patients against increased chances of death by only employing local anodyne measures that will not mask the advance of complications.

The great majority of the cases begin to decrease within the first twenty-four hours; purely medical lines are indicated in such cases. Ball (Brit. Med. Jour., June 25, '92).

An immense majority of cases in adults recover under medical treatment. In children the disease is much more grave, but shock from perforation is less great in them. Rendu (La Semaine Méd., Dec. 12, '94).

If nausea disappears in twelve hours: if tenderness on pressure is not increased in twelve hours; if the temperature is normal or not above 100° F. in the mouth; if the pulse is normal or but little accelerated; if the patient move in bed with ease, recovery without operation is probable. Jos. Price (Buffalo Med. and Surg. Jour., Dec., '91).

A large number of catarrhal cases are cured by medical treatment; but when the disease advances to pus formation surgical treatment is needed. "If we err, let it be on the side of too early, rather than on that of too long delayed operation." Da Costa (Med. News, May 26, '94).

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The surgeon is brought face to face with a condition which has a recognized mortality of about 5 to 8 per cent.: too high a percentage. We first have to contend with the presence of a suppuration. In 450 cases I do not think there has been an entire absence of pus in one single instance. I am satisfied there are some cases which can be cured by medicine, but can they be differentiated? By medical treatment we have a mortality of 10 per cent., and, if we have 3 per cent. by the knife, then we must operate to save the other 7 per cent. J. B. Murphy (Amer. Medico-Surg. Bull., Oct. 10, '96).

No fixed rule can be laid down for deciding in the early stages between the mild and severe cases. No man is capable of deciding the question correctly in all cases, but, to one properly experienced, an indescribable character of some one symptom may indicate a malignant process. Syms (N. Y. Med. Jour., May 15, '97).

In a series of 517 cases the mortality was 23.8 per cent. in those of the cases treated in pre-operative days. Of the 517 cases, 389 were operated on and 128 treated without operation. In the latter the mortality was 3.12. Of 319, 81 were interval cases, in which there was one death. Of 305 operated on in the acute stage, 68 died. The great point in treatment is to anticipate the severer forms resulting in septic peritonitis by early surgical interference. Rule to advise operation at the end of twenty-four hours or thirty-six hours, if the patient is not improving. G. E. Armstrong, (Lancet, Sept. 18, '97).

Surgical Treatment.—Operation is indicated:—

1. When severe symptoms come on suddenly, either at the onset or during the course of the disease.

2. When in a mild case the symptoms are gradually increasing in intensity up to the third day.

3. When, by the third day, a firm, gradually growing mass can be felt at the seat of localized pain, and especially if there is localized œdema.

4. When abdominal distension, high pulse, diffusion of pain, and other evidences of general peritonitis come on at any time in the course of the disease.

Laparotomy is indicated before the pathological process has reached a very advanced stage. This cannot be measured by time. In some the rapidity of the process is very marked, in others very slow. Some patients ask for at-

tendance on the first day, and some not until the third or fourth day. Charles McBurney (Annals of Surgery, Apr., '91).

By the second day, certainly by the third and *à fortiori* later, the operation should be done if the following indications are present: (1) if there is abdominal pain, most marked in the right iliac fossa, and especially with tenderness at McBurney's point, attended possibly with nausea and vomiting; (2) if there is rigidity of the right abdominal wall; (3) if there is fever up to 100° F., 101° F., or 102° F., which does not yield to medical treatment; (4) if by minute and careful palpation tumefaction and increased resistance can be discovered with possible dullness and, rarely, fluctuation; and (5) if there is œdema of the abdominal wall. W. W. Keen (Annals of Surgery, Apr., '91).

Experience of one hundred and eighty-one cases. Operation is called for immediately in a sudden severe attack of appendicitis with pain, vomiting, more or less distension, and high pulse, with localized tenderness. In such a case the appendix is usually perforated and the bacteria are very virulent. Richardson (Amer. Jour. Med. Sciences, Jan., '94).

Every case, promising or unpromising, should be treated by surgical operation at the earliest possible moment. Murphy (Med. News, Jan. 5, '95).

In entire personal experience not a death seen which could not properly be ascribed to delay in timely and skillful surgical interference. Every case from the very beginning should be treated by a surgeon, with a medical attendant. Wyeth (N. Y. Med. Jour., June 30, '94).

Operative interference is indicated in every case in which the onset is sudden and the symptoms are decidedly acute and severe, and in every mild case in which symptoms are unrelieved at the end of forty-eight hours. It is certainly indicated whenever a firm, slowly-forming mass is felt in the right iliac fossa or when a sudden increase in sharpness or diffusion of pain points to perforation. J. W. White (Brit. Med. Jour., Feb. 9, '95).

The earlier the operation, the less need of drainage and the firmer the abdominal wall. Surgeons seldom regret an early operation. Gage (Boston Med. and Surg. Jour., May 24, '94).

The most successful operations are those performed within twenty-four hours of the onset of the attack. Hurd (Medical Age, June 25, '92).

Four cases of operation for perforating appendicitis with fatal result because performed too late. It is better in acute appendicitis to operate prematurely than to wait until the general symptoms become intense. Berger (La Semaine Méd., Mar. 30, June 8, '92).

Five-eighths of all cases, and one-fourth of the cases which had been treated medically alone, should have been operated on. Fitz (Annals of Surgery, Apr., '91).

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That some patients get comparatively well without operation no one denies, but usually improvement commences in such cases within from twelve to sixteen hours from the onset. On the contrary, if the symptoms become aggravated after this time or if the disease persists in spite of palliative measures (opium excluded), it becomes an operative case, and the physician or surgeon who hesitates to advise operation robs his patient of one of the best means known to science at the present day of saving life in this dreaded disease. J. C. Kennedy (Med. Record, Nov. 14, '96).

We should operate on every operable case as soon as the diagnosis has been made. Mistakes are made by waiting and watching for symptoms to manifest themselves. A. M. Cartledge (Med. News, Nov. 28, '96).

The safest general rule is to operate as soon as a diagnosis of appendicitis is made. C. P. Noble (Med. News, Nov. 28, '96).

Six cases of appendicitis emphasizing the importance of early operative interference. A. J. Coley (Med. News, Nov. 28, '96).

Estimate of the number of appendiceal patients who die under medical treatment, based on 100 consecutive per-

sonal operative cases. In that particular series the death would have been about 28 per cent. eventually.

One Hundred Consecutive Operative Appendiceal Cases.	Estimated Deaths Under Medical Treatment.
7 cases of tuberculosis and cancer	5
1 case of strangulation of bowels by appendix adhesion band.	1
38 abscess cases	15
8 cases with hard, incarcerated concretions	2
12 cases of occluding stricture dams	5
34 cases in common interval stages or in acute stages before advent of pus	0

The surgical death-rate in this series of 100 cases was 2 per cent. R. T. Morris (Med. Record, Dec. 26, '96).

In diffuse perforative appendicitis patients have the best chance to recover if operated upon within the first twelve hours. In acute appendicitis, if the pulse goes up above 116 to 120, the indication is for an operation. In mild cases of appendicitis, after the first severe attack, the appendix should be looked upon as a diseased organ which is very likely to give repeated and even fatal trouble in the future. W. Meyer (Med. Record, Feb. 29, '96).

In appendicitis complicating pregnancy early operation on all but the very mildest cases recommended. 1. Within twelve hours in acute perforative cases. 2. A rapid pulse (116 to 120) is a strong indication for operation. 3. If doubt exists, operation. 4. If, after a sudden lull in symptoms, recurrence manifests itself, operation. 5. In recurrent attacks, during pregnancy, even if mild, operation indicated, especially in the early months of gestation. This removes the possibility of a future attack in the later months, when the precedure is more difficult. Abrahams (Amer. Jour. Obst., Feb., '97).

Views of a large number of representative surgeons on chief indications for operation: 1. Operation during the first twenty-four hours gives a mortality of 1 to 2 per cent., but 60 per cent. of these operations are unnecessary. 2. Operation only in very severe cases and for suppuration gives a mortality of 17 to 25 per cent. 3. Operation between these extremes gives a mortality of 14 per cent. Frederick Winnett (Canadian Practitioner, Mar., '97).

So long as pain remains well confined to its original seat there is no need for haste, but if it extends to some other part of the abdomen, even if it be not actually generalized, there should be no delay in the adoption of operative procedures. James Jamieson (Int. Med. Jour. of Australasia, Feb. 20, '97).

1. A frequent or progressively accelerated pulse-rate of itself a prime indication for operation. 2. Pain localized and progressive is a valuable associated condition. When pain is sudden, severe, and progressive, and accompanied with chill, it means perforation or abscess, rupture, and operation. 3. Increase of temperature is third in importance, but when associated with one or more of the previous symptoms, and more especially with increase of pulse-rate, it makes immediate operation a foregone conclusion. 4. The gradual subsidence of the three cardinal symptoms—pulse-rate, pain, and temperature—is a legitimate reason for postponing immediate operative interference. 5. In cases of abscess it is generally safer, while watching for urgent indications, to wait until adhesions have formed a sufficiently protective wall. 6. In cases of recovery after mild attacks and without operation we are never sure of recurrence until the latter takes place, when the operation can be done soon enough, and, all other circumstances being equal, preferably in the interval of a succeeding attack, when the tissues are not in an inflamed condition. G. F. Shrady (Med. Record, Jan. 9, '97).

As soon as appendicitis is diagnosed, no matter how mild the case may be, an immediate operation should be performed, unless a patient is in severe shock following sudden perforation. In such cases the shock should be first overcome.

While preparing for operation and in those cases in which an operation has

been refused, the first thing to do is to give a dose of castor-oil or calomel; an enema should also be given and the patient kept quiet. The diet should be liquid and an external application of ice used. Opium should not be given in any form. In bad cases of appendicitis, when the abdomen is filled with pus and the intestines are paralyzed by overdistension, morphine, and infection, an opening into the intestines to promote intestinal drainage will be a benefit. E. M. Pond (Med. Record, Apr. 23, '98).

Series of 81 cases, all acute with 1 exception, all suppurative or gangrenous, and 4 complicated with peritonitis in which appendicectomy was performed with perfect recovery with 1 exception. Operation favored in the acute stage and as soon as diagnosis is made. Twice the appendix was found on the left side of the body; the cases were consecutive suppurative or gangrenous appendicitis. In all but 1 the appendix was perforated. Bernays (Med. Record, Apr. 2, '98).

Early operation is the only treatment upon which reliance may be placed for a definite and curative result in the vast majority of cases. The medical treatment of acute attack should consist in the administration of a purgative and the local application of cold. Morphine and opium are to be strictly avoided, except occasionally, when the pain is very severe, and then are to be given in conjunction with a purgative.

In surgical treatment early operation is to be instituted, and, when feasible, the appendix should be removed, even though surrounded by pus. In removing the appendix, it should be cut out of the cæcum and the gut sutured, after the manner of any ordinary intestinal wound. J. B. Deaver (Annals of Surg., Mar., '98).

Two cases of appendicitis in pregnant women operated on. Both cases recovered and neither miscarried. One should not hesitate to operate during any period of pregnancy, or even during parturition, if the case requires it. Hunter McGuire (Southern Med. Record; Canada Lancet, May, '98).

Case of successful operation for appendicitis during the eighth month of pregnancy; dermoid cyst with a twisted pedicle also removed. Twelve hours after the operation labor-pains set in and the woman was normally delivered of a live child. At time of report, just fourteen days after the operation, both mother and child are alive and well. A. G. Gerster (Annals of Surg., May, '98).

Aspiration of the abscess through the abdominal wall is only indicated when it is clearly superficial; otherwise the chances of striking the abscess itself are very small and the risk may be great.

If no improvement shows itself within forty-eight hours, exploratory incision should at least be made. Marshall (Boston Med. and Surg. Jour., July 21, '92).

It is preferable to perform an aseptic exploratory section and be proved wrong in diagnosis than to wait until an operation is rendered necessary by perforation and peritonitis. Grandin (N. Y. Med. Record, Dec. 1, '94).

There are cases in which, although the diagnosis is not absolutely certain, it may be quite justifiable to make an exploratory incision. MacCormac (Clinical Jour., Sept. 26, '94).

Rectal puncture and drainage are not as dangerous as laparotomy when the patient is moribund, while they offer a chance of relief. Anæsthesia is not necessary. Richardson (Boston Med. and Surg. Jour., Mar. 17, '92).

Case of a robust male who declined operation, but allowed an aspiration; a half-pint of thick, offensive pus removed. Recovery. Noble (Memphis Med. Monthly, Sept., '94).

Operative Technique.—*Incision.*—The incision that is generally preferred at present is that recommended by McBurney (see *b*, *colored plate*). It crosses an imaginary line (*a*) drawn from the anterior superior spine of the ilium (D) to the umbilicus (A) at the junction of its middle and lower thirds, and thus overlying the diseased structures. The integument and aponeurotic structures are alone to be incised, the muscular fibres being separated by means of the scalpel-handle in a line parallel

to their course. As a result, muscular action will rather tend to approximate than to draw apart the edges of the wound and thus prevent post-operative hernia: a condition frequently met with, especially when the median incision was generally used. The latter is still resorted to by some surgeons, and is especially useful when diffuse abscess is present.

> The lateral incision is preferred, because (1) it lies directly over the route of the appendix; (2) it exposes the field of operation more favorably than the median; (3) it creates a shorter, a less exposed, line of drainage. The advantages of the median incision are: (1) greater probability of not encountering adhesions between the anterior wall and the intestines in the line of incision; (2) easier access to all parts of the peritoneal cavity for washing and for drainage. Joseph Price (Buffalo Med. and Surg. Jour., Dec., '91).

The frequency of post-operative hernia has caused surgeons to greatly reduce the length of incisions, and Morris has shown that an opening through the muscular tissues $1\,^1/_2$ inches in length was sufficient in the majority of instances. McBurney has found that even in his method the opening in the deeper layers of the abdominal wall need not be more than two inches in length.

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> Probably few appreciate the number of cases of hernia following this operation. Since April, 1895, there have been observed at the Hospital for the Ruptured and Crippled fifty-five cases. There was evidence that in many instances the wound was improperly closed. Perhaps in a large majority of the cases there had evidently been suppuration during the healing of the wound. Coley (Annals of Surg., Aug., '97).
>
> Surgeons are now using a much smaller incision than formerly in order that they may avoid post-operative hernia, which is due to the fact that the lines of muscle-traction at this point are different in the different muscles. A pad over the seat of operation induces hernia by causing absorption of the new connective tissue as it is being formed. The margin of each muscle should be separated with the greatest care when operating; likewise care should be taken in dividing the peritoneum. In closing the wound each different layer of muscular tissue as well as the peritoneum and fascia should be united with the same tissue from which it was separated in the beginning. Thus the lines of muscular traction will not be disturbed, and hernia is less likely to be produced. No bandage or pad should be applied. The patient should be kept in bed for at least twenty-five days following the operation. R. T. Morris (Southern Practitioner, Nov., '97).

McBurney recommended his method only for non-suppurative cases or those in which drainage was not required, but many surgeons employ it with advantage in almost all cases of appendicitis, including those in which an abscess is present and where drainage is required.

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> Three illustrative cases. In all, the abdomen had been opened by splitting the aponeurosis of the external oblique, separating the fibres of the underlying muscles, and dividing the fascia and peritoneum transversely. After having removed the appendix and the pus, and inserted gauze and rubber drains, the opening was narrowed by catgut sutures in the different layers, leaving a hole not more than an inch in diameter, which proved ample for drainage. In cases in which the opening proved too small to permit of the necessary manipulation within the abdomen, it could be enlarged by cutting at right angles to the deeper part of the incision along the border of the rectus; this secondary incision could then be closed by suture, and drainage made through the pri-

mary portion as in other cases. Stimson (Annals of Surg., Mar., '97).

The McBurney method employed during the past year in all suppurative as well as non-suppurative cases. Without cutting muscular structures it is possible to separate the internal oblique and transversalis muscle fibres in an outward direction, so as to make a large-enough opening to approach any abscess-cavity in the iliac fossa and perform necessary manipulation in suppurative cases, including ligation or treating the appendix as desired. In leaving an opening in the intermuscular space to permit drainage there was no trouble in subsequent healing of the wound. The natural tendency of the muscular fibres to draw together in the direction of their length approximated those which had been drawn out of their course, and permitted them to resume their function. As a rule, after granulation the wound unites in a fine, linear scar, without stitching. Abbe (Annals of Surg., Aug., '97).

Some operators have found that when the appendix is in the normal position and is not difficult to bring out, McBurney's method is almost ideal; but when difficulties arise and the incision has to be enlarged, the necessarily constant and hard retraction of the muscles is likely to injure the tissue and sometimes to cause suppuration. If it is necessary to enlarge the wound, there results a ragged and complicated wound, not well adapted to drainage if pus is found. The position of McBurney's incision is also thought by some to render proper drainage difficult to obtain. Other incisions are therefore resorted to.

The hypogastric incision (*f*) may be more or less near the spine of the ilium, beginning a little above the line drawn from the umbilicus to the spine of the ilium, or it may be made wholly below this line. At the outset it may be two inches in length, and subsequently be extended in either direction if necessary.

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This incision affords the following advantages: Less danger of injuring the subjacent intestine, the ileum, and the caput coli; less tendency to prolapse of the omentum and the ileum; it "walls off" the general peritoneal cavity with facility and certainty; it affords excellent drainage at the time of the operation, as well as subsequently. An abscess can be opened on its outer aspect in such a way as to prevent infection of the peritoneal cavity: a point of much importance. A minimum of injury is done to the muscles and nerves, and repair has not been followed by ventral hernia. J. S. Wight (N. Y. Med. Jour., Oct. 24, '96).

An incision proposed by Jalaguier and recently recommended by Kammerer is especially applicable to cases occurring in slim children. It is thought to prevent post-operative hernia better than any other. The skin and the aponeurosis of the external oblique are incised at the outer border of the rectus (*d*), and the aponeurosis on the inner side of this incision is then dissected for some distance from the anterior sheath of the muscle, and drawn toward the median line, exposing the sheath. An incision (*e*) parallel to the first is then made in the latter sheath about one-half inch to the inside of the border of the rectus, exposing the muscle. When the operation is finished, the deeper incision is closed and the rectus, permitted to slip in place, acts as protecting covering. Kammerer recommends it for adults.

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The above incision employed with success in eleven cases occurring in slim children at the Hôpital Trousseau. In adults the usual incisions are preferable. Jalaguier (Presse Méd., Feb. 3, '97).

It may also be used in adults. Some of the points in favor of the modified incision at the border of the rectus are: the simplicity of the procedure; the

possibility of doing the operation with one assistant: the technical advantage when operating on persons with well-developed abdominal muscles. F. Kammerer (Med. Record, Dec. 11, '97).

Modified incisions have also been proposed by other surgeons, among which those of Elliot and Vischer appear to be the most interesting.

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To avoid the drawbacks of the McBurney incision a longitudinal cut is made through the skin and the aponeurosis of the external oblique, beginning one-half inch inside the anterior spine of the ilium, and extending to the linea semilunaris. The fibres of the external oblique are thus cut across, but the fibres of the internal oblique and transversalis are separated as in the McBurney operation. The wound is closed by passing two rows of sutures through all the layers of the abdomen, to prevent a dead space, and uniting the cut edges of the external oblique with a continuous, buried, silk suture. No nerves or muscles are cut; there is no resulting anæsthesia of the skin. The aponeurosis of the external oblique has united well in every case. Elliot (Boston Med. and Surg. Jour., Oct. 29, '96).

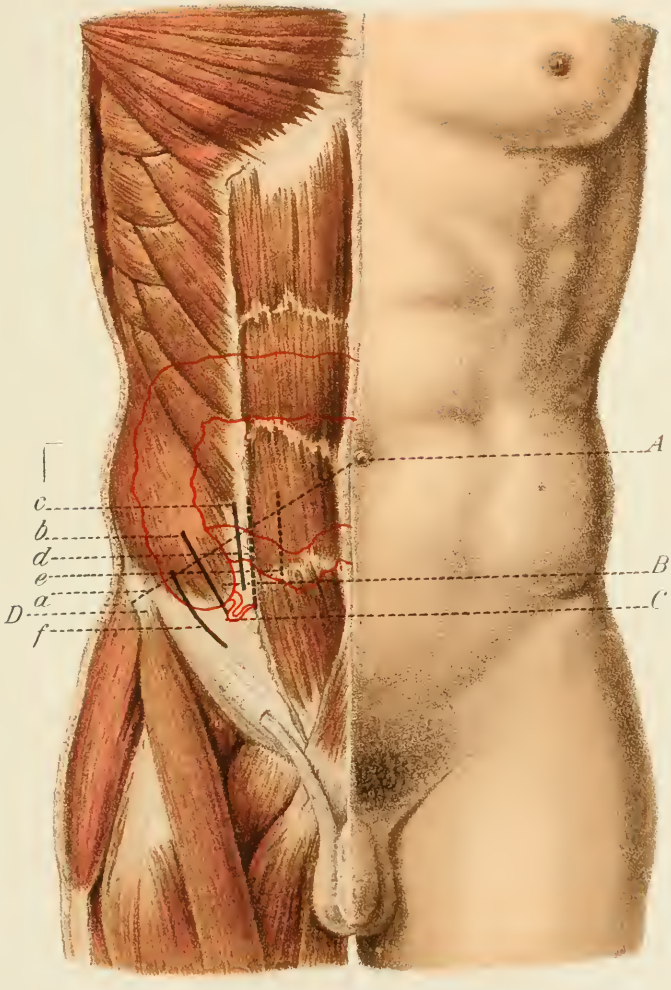
To easily locate the appendix and facilitate free drainage, an incision is made through a more muscular and dependent portion of the abdominal wall an inch above and parallel to the crest of the ilium, beginning at the outer edge of the external oblique, and running forward to a point corresponding to the anterior superior iliac spine, or, if necessary, slightly beyond this. Having divided the skin and aponeurosis, the external oblique, which is found well developed at this point, and its fibres running nearly vertical, is separated, after which the internal oblique and transversalis, which are also well developed, and whose fibres run nearly on one plane, are separated, exposing the transversalis fascia. This, together with the peritoneum, is divided in a vertical direction. This will be found to have opened the peritoneal cavity at its lowermost plane and near to the attachment of the cæcum. A finger, now being introduced, invariably comes in contact with the caput coli, which can be readily drawn into the wound, and thereby facilitate the search for the appendix. In suppurative cases, the pus-cavity being opened at this point, drainage follows at the most dependent point. The greatest disadvantages are the depth of the wound and hæmorrhage from a small muscular branch of the circumflex iliac artery, which can readily be controlled. C. V. Vischer (Annals of Surg., Nov., '97).

Method whereby weakening of the abdominal wall is avoided: The uninjured rectus muscle is interposed between carefully-united layers which do not accurately correspond with one another, and the risk of hernial protrusion is done way with. Light abdominal percussion in all cases of obscure abdominal pain insisted on. W. H. Battle (Brit. Med. Jour., Apr. 17, '97).

The abdominal walls having been penetrated, the margins of the wound are then retracted by an assistant, unless the abscess has already reached the surface. The peritoneum is then divided freely, but with great care.

Matted coils are gently separated and intestinal prolapse and contact with diseased surfaces are prevented by carefully packing the cavity around the cæcum with pads of iodoform gauze, the ends remaining outside or being held by clamps. This should be done in such a manner that no infected tissue or fluid be in any way brought in contact with the healthy peritoneum. The walls of the pus-cavity are then disinfected with a bichloride solution of 1 to 5000.

The cæcum being now isolated, it is important to also remove the cause of the abscess or its contents without causing septic material to invade the general peritoneal cavity.



Lines of incision in Laparotomy for Appendicitis

A Umbilicus B Cæcum and termination of the Ileum C Vermiform Appendix D Anterior Superior Spine of the Ilium

Buck & McFetridge Co Lith Phila

Literature of '96-'97-'98.

If, in handling, any adhesions are broken through, it is quite easy for a coil of intestine which is not infected to enter the abscess-cavity through the opening made and to become at once infected, then rapidly disappear and reach a situation where it is entirely beyond control; or, if such an accidental break in the wall of the abscess have been made and a small quantity of the abscess-contents have escaped among the uninfected intestines, fatal infection may result. McBurney (Buffalo Med. Jour., June, '96).

If the appendix is not readily found, the anterior longitudinal band of the cæcum is taken as a guide and followed until the appendix is encountered,—usually behind. In the annexed *colored plate* only the tip of the appendix shows; but the greater part of the organ lies behind the cæcum, its orifice in the latter being situated immediately under the spot where the McBurney incision (*b*) crosses index line (*e*).

When the abdominal cavity has been opened the exact position of the appendix can be found by following the white fibrous bands along the convex surface of the cæcum to the base of the appendix. Murphy (Jour. Amer. Med. Assoc., Mar. 30, '95).

The peritoneum completely surrounds the cæcum and its appendix. Treves, Talamon (Amer. Med. Digest, June, Oct., and Nov., '90).

The possibility of an anomalous conformation or position of the appendix should be borne in mind.

In but three instances out of one hundred and forty-four operations for diseases not connected with the appendix was the appendix found outside of the peritoneal cavity. In sixty-six examinations 40 per cent. of the appendices were free; in that number one-half of the entire length was surrounded with peritoneum. Joseph D. Bryant (Mathews's Med. Quarterly, '94).

In two cases the appendix was found attached to the left Fallopian tube and bound up in an adherent mass on that side. In a great number of cases the appendix is adherent to the Fallopian tube on the right side. Porter (Berliner klin. Woch., Sept. 4, '95).

Case in which tip of vermiform appendix was found in contact with the under surface of liver. Bland Sutton (Med. Press and Circular, Oct. 10, '94).

Case in which an anomalous cæcum and appendix were situated on the quadratus lumborum muscle, an inch and a half above the right iliac crest. Farnum (Occidental Med. Times, Mar., '94).

Case in which the appendix was coiled on itself and imbedded in cellular elements on the surface of the iliac fascia, entirely outside of the peritoneal cavity. F. N. Manley (Buffalo Med. and Surg. Jour., May, '91).

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In one hundred and fifty cases of post-mortem examinations the length of the appendix varied from 2½ to 9¾ inches. Only two came above the general measurements,—one 6½, and the other, the longest the author has been able to find any record of, 9¾ inches. Both of these extra-long appendices were found in males. C. J. Ringwell (Med. Record, July 18, '96).

Case in which the cæcum was found well toward the median line; the appendix was lying directly across the abdominal cavity, bound to the omentum in the left iliac fossa. M. M. Franklin (Univ. Med. Mag., Oct., '97).

If the appendix contain a concretion or foreign body, or is enlarged, perforated, or otherwise abnormal, it should be tied close to the cæcum, then cut off below the ligature. It is sometimes found detached and necrotic.

If there is a circumscribed abscess, it is poor surgery to insist, in every case and at every period, upon finding and taking away the appendix in the face of all obstacles. In many cases of circumscribed abscess, and especially in those

in which the appendix is bound down by adhesions in the depth of the wound, the surgeon should be content with evacuation, irrigation, drainage, and packing with iodoform gauze. Persistent search for the appendix and attempts at its removal in these cases are attended with such danger of opening the peritoneal cavity that they are not to be recommended. (J. William White.)

The appendix should be removed when there is no pus; when an endoappendicular abscess is present; as a rule, when there is a periappendicular abscess requiring drainage through peritoneal cavity; and when there is a general peritonitis without adhesions. Porter (Med. News, Sept. 14, '95).

When circumscribed peritonitis and abscess exist the indication is clearly to drain. To persist in breaking up adhesions for the sake of removing the appendix is not wise. Richardson (Amer. Jour. Med. Sciences, Jan., '94).

Fourteen cases in which incision, clearing out of septic material, protection of the peritoneal cavity, and drainage in cases of ruptured appendicitis with abscess, but no attempt to find the appendix, were the measures adopted. No death. J. M. Barton (College and Clin. Record, May, '94).

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There are some cases, not few in number, in which the appendix is so deeply imbedded in the wall of the abscess, or so difficult to define at all, that to insist upon its discovery and complete removal would be to incur quite unjustifiable risk. One had better be content with properly evacuating, cleansing, and packing the cavity, leaving the appendix or its remnant to be disposed of by its obliteration in the wound-healing, or by its removal at a later and more favorable time through a second operation. McBurney (Univ. Med. Mag., Mar., '96).

It has been my practice to carefully evacuate and cleanse by dry sponging with sterilized or iodoform gauze the pus-cavity; then to disinfect its walls with a bichloride solution, 1 to 5000; and then to search for and remove the appendix in case it be readily found and easily separated from the adhesions. In general, I have found this feasible in cases operated on up to the seventh or tenth day. In cases operated on at a later date, or those where the abscess is distinctly circumscribed with firm walls and containing several ounces of pus, I have not attempted to remove the appendix. Bull (Univ. Med. Mag., Mar., '96).

It has been my habit for years in cases of acute appendicitis with extensive suppuration to simply incise, disinfect, and drain the abscess, unless the diseased appendix could be removed without any additional risk. I have seen a number of such cases recover permanently without any additional surgical interference. I regard persistent search for the appendix in such cases hazardous, as it often results in opening of the free peritoneal cavity and fatal septic peritonitis. Senn (Univ. Med. Mag., Mar., '96).

The stump is either simply disinfected or the mucous membrane of cut surface cauterized with carbolic acid or cautery. The latter procedure is generally unnecessary, however. If the tissues about the base of the appendix are nearly normal, it is better to invert the stump and close it with two or three Lembert sutures.

The methods of dealing with the stump at present employed are far from perfect. After removing the appendix a continuous Lembert suture should be run around the appendix like a purse-string. The appendix is then divided, leaving the stump never shorter than one-half inch. The stump is then invaginated,—turned "outside in," as a glove-finger,—the appendix end thus being inserted one-half inch *inside* the cæcum. Dawbarn (Inter. Jour. of Surg., vol. viii, No. 8).

In whatsoever manner treated, the stump remains as an excrescence, with chances of adhesions. To eliminate

these, inversion into the lumen of the large intestine of either the entire appendix or any part remaining attached to the caput coli is recommended. Edebohls (Amer. Jour. Med. Sciences, June, '95).

No part of stump should be ligated so as to cause possible strangulation. All coats in healthy tissue should be cut off on the same level, the stump transfixed with two crossed sutures near margin, which perfectly closes the end and causes approximation of all coats. Inversion is then practiced. Ruth (Mathews's Med. Quarterly, July, '95).

The sclerosed mucous and submucous coats being comparatively loose within the other outer coats close to the cæcum, on circular division of the latter being made they can be drawn out an inch or so in an unbroken tube. A ligature around the tube formed of the outer coats, after the cæcum and the mucous membrane are thus cut, may then be applied. Barker (Brit. Med. Jour., Apr. 20, '95).

Drainage is to be maintained until healing is shown to be taking place from the bottom of the wound. Gauze is to be used not only for the purpose, but quite as much to stimulate the adhesions between coils of intestine which surround it and to shut off the general peritoneal cavity from the infected portion. (Halsted.)

The Mikulicz drain, a bundle of lamp-wicks, is an exceedingly potent means of produc.ng drainage. Wood (N. Y. Med. Jour., May, '95).

Packing with iodoform gauze after abdominal operations is the best method for preventing infection of the general peritoneal cavity; more certain to prevent hæmorrhage and sepsis than the use of a drainage-tube. Mixter (Boston Med. and Surg. Jour., Dec. 31, '91).

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In suppurative appendicitis conclusions that:—

1. Where pus is present, tubing should be used, for gauze will not free a cavity of pus.

2. Where inflammatory transudate or exudate is present gauze proves the most satisfactory.

3. Where gauze drainage is used in the peritoneal cavity the external end should be lower than the internal, allowing much freer action.

4. Mixed drainage is to be recommended where septic peritonitis accompanies suppurative appendicitis.

5. Drainage should be dispensed with as soon as possible, and the external wound allowed to unite, for, the sooner the union the better, and the chances of a ventral hernia following are less. A. McLean (Med. Age, Oct. 25, '98).

It is important to withdraw the gauze plugs by rotary movement rather than by direct traction; it causes less pain. The patient should be revived from the shock of the operation as early as possible by an enema of hot coffee or whisky. (Abbe.)

Literature of '96-'97-'98.

Two cases in which a circumscribed abscess was drained, and a sinus persisted until the appendix was removed, some months later. Removal of the appendix performed through an incision parallel to one internal to the original one. The sinus, unopened, was followed down to the appendix, which was removed after the healthy parts had been carefully walled off. All sinuses in the neighborhood of the appendix should be approached in this way. It is easier to prevent infection of the peritoneum if the cavity be freely opened so that the healthy parts may be protected and the situation of the appendix defined, than if the surgeon attempts to follow the sinus from the first, not knowing exactly where he may open the peritoneal cavity. Collins Warren (Boston Med. and Surg. Jour., Oct. 28, '96).

Remote Abscesses.—While the majority of abscesses are found in the appendicular region, others may occupy areas quite remote from the latter. To properly locate such an abscess is of

great importance. When their evacuation becomes necessary the selection of the best point for incision is in order. This subject is graphically portrayed in the annexed colored plate prepared from sketches and an interesting paper published by Dr. M. L. Harris.

Description of Colored Plate on the Location of Appendicular Abscesses.—A circle of an inch and a half in diameter,—the size of a silver dollar,—drawn about the centre of the posterior surface of the cæcum, will touch the base or point of origin of the appendix in about 96 per cent. of all cases. It will thus be seen how constant is the location of the base of the appendix. The average length of the adult appendix is nine centimetres, or three and one-half inches. A circle, then, of four-inch radius, drawn about the same centre as the smaller circle, will give a very large area in the abdominal cavity, anywhere within which the apex of the normal appendix may be found located. (See Fig. 1.)

The space within the large circle (see Fig. 2) may be subdivided into five separate areas (marked 1, 2, 3, 4, and 5), each having distinct and well-defined boundaries. The appendix may be found in any one of these areas, and, when an abscess forms about the inflamed organ, it is the particular area in which the appendix is located which gives the abscess or exudate its characteristic location and outline, which limits its extension in one direction and favors it in another, and which should guide us in the selection of the best point for incision.

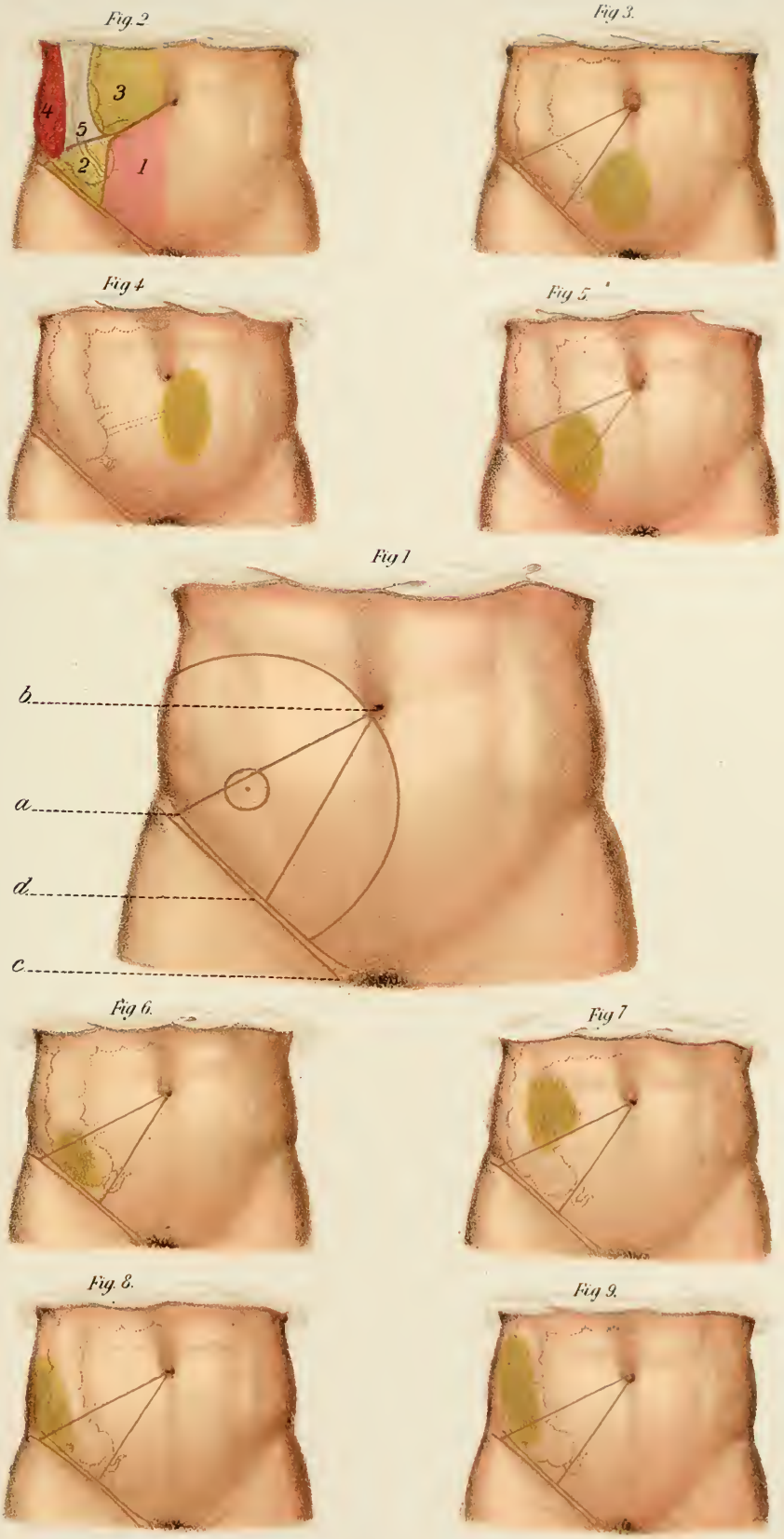
Area 1: *Infra-mesenteric.*—The appendix is met with in this area in about 60 per cent. of the cases, either superficially situated, approaching anteriorly, or lying deeply on the posterior wall; it may extend directly inward, hugging the under surface of the mesentery at the ileum, or inward and downward, reaching often into the true pelvis. The mesentery above prevents the extension of abscesses in an upward direction, but gives them a tendency to extend forward and to the left.

The pelvic abscesses are limited in the male anteriorly by the bladder, posteriorly by the rectum and pelvic wall and above by the sigmoid and loops of small intestine. In the female they fill Douglas's *cul-de-sac* or occupy the ovarian region on one or both sides, where they are often with great difficulty differentiated from pelvic abscesses of tubal or ovarian origin. The danger of infecting the general cavity on opening these abscesses from above is very great, and the advisability of draining through the vagina in the female, as in other septic pelvic troubles, comes into serious consideration.

The inter-intestinal abscesses (see also Figs. 3 and 4) are usually situated near the median line, and are consequently best opened at this point. Adhesions may limit them, or there may be no adhesions and the free peritoneal cavity must be traversed to reach the abscess, after packing with iodoform gauze to prevent diffusion of pus. It is often impossible to prevent pus escaping into the general cavity, with a resulting fatal acute septic peritonitis. It is in those cases that the advisability of doing a *deux temps* operation should be considered. Should the appendix be found floating free in the abscess-cavity it may be removed, but if it be firmly imbedded in the exudate forming part of the abscess-wall it should, under no circumstances, be torn out and removed, if by so doing we endanger breaking into the general cavity, thus leading to general sepsis.

The exudate may also come to the surface, forming adhesions to the anterior abdominal wall, just internal to the cæcum. (See Fig. 5.) The abscess is limited externally by the cæcum and internally by the loop of ileum which almost always covers over the end of the cæcum and the omentum. It is usually best opened by a vertical incision over the inner border of the cæcum. Care should be taken not to separate the loop of intestine internally, particularly at its lower angle, as pus then escapes at once into the pelvis. The appendix can nearly always be removed, as it usually lies posteriorly or anteriorly, and it can be done without disturbing the internal wall of exudate which protects the general cavity.

Area 2: *Retro-cæcal.*—Abscess is met in this area (see also Fig. 6) in about 23 per cent. of the cases. The appendix lies in the little pouch posterior to the cæcum, more or less curved or folded upon itself or extending downward and outward.



Location of Appendicular Abscess. (M. L. Harris.)

a Anterior Superior Spine of the Ilium b. Umbillicus. c. Symphysis. d. Poupart's ligament

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It is best opened by an oblique incision parallel to the outer half of Poupart's ligament, coming down upon the outer border of the cæcum, which should be raised up and turned inward. The appendix can nearly always be removed, unless it should be too firmly imbedded in the exudate forming the inner wall.

Area 3: *Supra-mesenterie.*—Abscesses here (see also Fig. 7) have a tendency to spread toward the liver and duodenum. The appendix lies above the mesentery of the ilium and internal to the inner layer of the mesocolon.

These abscesses are best reached by an incision along the external border of the right rectus muscle, great care being taken not to break down the adhesions between the loop of small intestine to the inner side. (See incision *c* in first colored plate.)

Area 4: *External.*—This is the space between the outer border of the colon, with its outer layer of mesocolon, and the external abdominal wall. The appendix may extend upward and outward into this space, its tip sometimes reaching nearly to the under surface of the liver. Abscesses spread to the liver and have repeatedly ruptured into the pleura and even in to the bronchi. (See Fig. 8.)

They may be reached by an oblique incision extending from above the crest of the ilium downward and inward, parallel to the outer third of Poupart's ligament; or, if the abscess is high up, by a longitudinal incision over its most prominent part, care being taken to not injure the ilio-hypogastric nerve. The appendix can nearly always be removed, as there is no danger, in separating the adhesions about it, of opening the general cavity.

Area 5: *Retro-colonic, or Extra-peritoneal.*—In the cellular space posterior to the colon between the two layers of the mesocolon. (See Fig. 9.) Abscesses here are entirely extra-peritoneal. The colon is pushed forward.

The incision in these cases should be an oblique one, similar to the one described under the fourth area, but extending pretty well above the crest of the ilium. M. L. Harris (Journal of the Amer. Med. Assoc., Dec. 21, '95).

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In retrocæcal suppurative appendicitis an incision recommended along the external border of the sacro-lumbar mass of muscle, and extending forward at the lower extremity parallel to and at a distance of about an inch from the crest of the ilium to within a distance of about an inch and one-fourth from the antero-superior iliac spine. The signs of retrocæcal abscess are the following: Tenderness over the triangle of Petit; but little, if any, pain at McBurney's point; marked fullness in the right flank; and a clear sound on percussing the right iliac fossa. If the appendix be found on one side or in the front of the cæcum, it may still be readily exposed by this incision. The situation of the wound permits perfect drainage and tends to secure the patient against the subsequent risk of hernia. Grinda (Méd. Mod., No. 71, '97).

Diffuse Abscess.—If an abscess has opened into the peritoneal cavity, causing diffused septic peritonitis, a good-sized incision is made parallel to the border of Poupart's ligament, the peritoneal cavity is opened, and the contained fluids are removed. The appendix is removed; further collections of fluid are looked for and withdrawn with a sponge on a handle. The cavity is washed out with a saline solution and drainage is provided for by a glass tube with a capillary gauze drain. The wound is left open, but no suturing is practiced. Nutrition by rectum for a day or two. The deep packing is not disturbed for four days. (McBurney.)

In twenty-four cases treated by the above procedure fourteen recoveries obtained. McBurney (N. Y. Med. Record, Mar. 30, '95).

Relapsing Form.

Symptoms.—The symptoms of an exacerbation are the same as in the acute form. The simple catarrhal form may be suspected when the recurrences happen more than four or five times, and last not more than a week and no tumor is felt.

The ulcerative form with its attending danger of perforation may be suspected when a tumor is felt in the interval, and especially when the tumor has increased in size during the access.

In fifty-seven cases of simple appendicitis, fifty-two showed appendicular perforation with abscess of surroundings. In eighty cases twenty presented at least one previous attack. Mathieu, Sonnenburg (Gaz. des. Hôp., Dec. 18, '94).

Perforation the rule in recurrent cases; the adhesions rupture, often without giving any sign, the patient dying of subacute peritonitis. Several instances in cases supposed to be cured. Broca (Bull. de la Soc. Anat., Dec., '94).

Etiology and Pathology.—The large majority of the attacks are due to any cause which may awaken the latent catarrhal process resulting from a previous attack treated medically. The pathological characters are the same as in the acute form, except in the fact that adhesions are likely to be found if anything but a very mild attack has previously occurred.

Instances in which there is only one attack are much more numerous than those in which there have been several attacks. The great majority of those who have passed through the stage of suppuration are rendered free from further attacks. Treves (Brit. Med. Jour., Mar. 9, '95).

After one attack the appendix is frequently as fully capable of originating another attack. Stimson, Bryant, Fowler (Annals of Surgery, May, '95).

Many cases of apparent cure by medical treatment not real and lasting. Schmidt (Archiv f. klin. Chirurgie, No. 43, '92).

Acute appendicitis may arise from the presence of bacterium coli and the chronic form from the tubercle bacillus or actinomyces. Czerny (London Lancet, May 4, '95).

There is a class of cases, "appendicitis obliterans," a comparatively frequent relapsing form, which is characterized by progressive obliteration of the lumen of the appendix. Ribbert found in four hundred post-mortems (death being due to other causes than appendicitis) partial or complete obliteration in 25 per cent. Senn (Jour. Amer. Med. Assoc., Mar. 24, '94).

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Intestinal obstruction consecutive to appendicitis does not appear to have come greatly under consideration. Certain symptoms which are attributed to relapsing appendicitis are merely due to intestinal obstruction in connection with peritoneal lesions of appendicular origin. Tuffier (La Semaine Méd., Dec. 16, '96).

In almost all chronic cases unattended by abscess or inflammatory adhesions, there is, first, a bend, or flexure, of the appendix; second, at the point of flexure there is also a stricture; and, third, distal to the stricture is marked distension of the appendix and great thickening of its walls. Supposing that the bend in the appendix is the first step in appendicitis, the bend embarrasses the escape of contents. To empty itself, the muscular walls are compelled to perform extra work, producing a very marked muscular hypertrophy. As a result of the pressure caused by the effort of the appendix to empty itself, the mucous coat at the point of flexion becomes eroded and inflamed, and functional stricture finally terminates in an organic stricture. This gives rise to recurring attacks of pain, which ceases when the appendix has discharged its contents. After a time, the organ is no longer able to empty itself. Distension, perforation, and peritonitis then follow. D. P. Allen (Med. Record, June 5, '97).

1. The chief agents in producing relapsing or recurrent appendicitis are micro-organisms latent in the thick walls of the vermiform appendix, in the strictures, and in the cicatricial tissue, and adhesions both peri-appendicular and parietal.

2. Alteration and enfeeblement of the walls of the appendix; as by infiltration of fat, and new formation and dilatation

of vessels, which readily favor both active and passive congestion or add to the results.

3. Certain appendices, apparently "healed," have some abrasion of the mucous membrane, which easily explains the presence of bacteria in the tissues, and by their development a reinfection is occasioned. Ch. von Mayer (Revue Méd. de la Suisse Rom., Apr. 20, '97).

Forty-five cases of appendicitis complicating pregnancy, diagnosis being confirmed in thirty by operation or post-mortem. It is concluded that: 1. Appendicitis may attack a pregnant woman at the beginning or at any time during pregnancy in the puerperium. 2. In most cases it causes abortion. The child dies, as a rule, very rapidly from infection. 3. It is only possible to save both mother and child when the abscess is limited and encysted. 4. Every type of appendicitis may occur. 5. The diagnosis may be difficult, owing to the enlarged uterus, or still more so during the puerperium, but is usually possible with care. 6. Treatment consists in operating as early as possible. A preliminary induction of premature labor is unjustifiable, since pregnancy is not always interrupted if the mother recovers. 7. Prophylaxis consists in operating in every case of relapsing appendicitis in a young girl or non-pregnant woman during the period of sexual activity. Pinard (La Sem. Méd., Mar. 23, '98).

Prognosis.—The chances that a first or second attack of acute catarrhal appendicitis will be renewed are about 77 per cent.; but, when a fourth or a fifth attack has occurred, the probability is very great that more will follow and ultimately end fatally, unless operation is performed.

After the patient has gone through an acute attack safely, and the characteristic tumor indicating an acute suppurative process is felt, a circumscribed peritonitis, rather than a general suppurative one, is likely to occur if another attack takes place.

Surgical Treatment. — This is indicated when the relapses are frequent and increasing in severity, and when a tumor is present during the interval, the presence of septic accumulation, ulceration, or perforation being likely. It should be performed during a period of quiescence in the manner described in the preceding pages.

In relapsing cases the operation should be performed between the attacks. Roux (Revue Méd. de la Suisse Rom., Sept., Oct., Nov., '91; Jan., '92).

Prompt surgical interference during the interval between the attacks is an advisable and safe procedure. The physical characteristics define clearly the situation of the appendix. Bryant (Jour. Amer. Med. Assoc., Nov. 3, '94).

Fifty-one cases of recurrent appendicitis operated during intervals between attacks, with but one death. Conservatism should be observed, however, about operating during an acute attack. There is no distinction between simple appendicitis and appendicitis with perforation, as far as operative indications go. Kummel (Le Bull. Méd., Oct. 6, '95).

The general consensus of opinion favors operation, both in latent cases with relapse and those which are accompanied by a general purulent peritonitis. Réclus (La Semaine Méd., June 22, '92).

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According to Czerny, the first acute attack of appendicitis belongs to the physician. This attack may: (*a*) pass by without complication, in which case there is no occasion for surgical interference; or (*b*) earlier or later, with alarming symptoms of general or local nature (fever, rapid pulse, pain, dullness on percussion, rigidity), it may go on to perforation and abscess-formation. Such an abscess either (*A*) leads to progressive and threatening general peritonitis or (*B*) it remains circumscribed and becomes incapsulated, the first severe symptoms continuing without important change. The conditions (*b*), (*A*), and (*B*) indicate surgical treatment, as do all chronic recurrent forms of appendicitis, whether they be purely catarrhal, ulcer-

ative, perforating, or obliterative. Editorial (Phila. Med. Jour., July 9, '98).

Four cases of chronic appendicitis, in each of which operation was clearly indicated and had been advised by several eminent surgeons, successfully treated by "tonic" doses of protiodide of mercury. Horwitz (Annals of Surg., Jan., '98).

The most suitable time for operation is about three weeks after the commencement of the attack, when all acute symptoms have disappeared and the temperature and pulse have become normal. G. Barling (Brit. Med. Jour., Jan. 29, '98).

Conclusions are that in all cases of appendicitis during the first attack, operation should not be performed unless suppuration or diffuse peritonitis requires it. In lapsing or recurrent cases, in which it is probable that distortion or other permanent injury to the appendix exists, one should operate. E. D. Ferguson (N. Y. Med. Jour., Mar. 26, '98).

After-treatment of the Various Forms.—The patient should not leave his bed until the subsidence of all trace of inflammation and, until proper healing of the wound have taken place,—namely, from three to five weeks. Otherwise there is great liability to recurrence or relapse.

The after-treatment is important and should be conducted with great care. The stomach should be given complete rest for twelve hours, cracked ice and water being allowed in moderation. After that, liquid food, beginning with peptonized milk, if there is any tendency to nausea or vomiting, may be given. To keep the intestinal tract as clear as possible, a daily injection of lukewarm soap and water is sufficient. The patient should lie on his back the first four days, then begin to change his positions in bed, if he desires, without violence. Opium should be given in small doses: just enough to check peristalsis.

The outside dressing should be changed every day at first, and the packing removed on the fourth or fifth day after operation. This should be done with great care and the cavity cleansed by dry sponging, no fluids being introduced into the wound. The wound is then repacked and left so three days, and renewed when necessary. As the packing is renewed from time to time, it should be reduced in size at each sitting so as to permit the wound to heal from the bottom.

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Apart from the actual tearing of adhesions or bowel by violent exercise, it is clear that great exertion or strain before the adhesions are properly organized and tough might lead to their stretching so as to form elongated bands, which may subsequently tend to intestinal obstruction.

It is therefore obviously prudent to impress upon patients the necessity for moderation in violent exercise for at least one year from the time of the operation. William H. Bennett (Clinical Jour., Sept. 7, '98).

William B. Coley,
New York.

ARECOLINE.—Arecoline is an active principle of the areca- or betel- nut, isolated by Jahns. It is a colorless, oily liquid, having a strong alkaline reaction, soluble in water, alcohol, ether, and chloroform at 428° F.

Dose.—In ophthalmic practice a 1-per-cent. solution is employed.

Physiological Action.—Arecoline possesses distinct myotic action, and has been used in ophthalmic practice. In its chemical and physiological properties this agent is closely allied to pelletierine, the alkaloid of pomegranate-root. It is distinctly poisonous, but physiological studies so far have not progressed sufficiently to give us a gen-

eral knowledge of its action upon the human body.

Therapeutics.—As a myotic agent the action of arecoline, though marked, lasts but a short time. When a few drops of a 1-per-cent. solution of arecoline bromohydrate are dropped into the eye, there is first a feeling of warmth, with some spasm of the lid; tears flow, and there is evidence of irritation, lasting about a minute and followed by some hyperæmia of the conjunctiva and slight superficial injection of the cornea, which also disappears in a few minutes. In about two minutes strong clonic contractions of the iris are seen, with decreased size of the pupil. The myosis is well marked in five minutes and reaches its maximum in ten minutes. Then a return toward the normal commences at the end of thirty minutes and in seventy minutes is complete. Subsequently a slight dilatation is noticed. When the myosis reaches its maximum the pupil acts very weakly and slowly to light. Test-type brought near the eye seems larger and clearer than when seen with the other eye. This megalopsia occurs in thirty to thirty-five minutes after the drug has been applied to the eye. Even after several applications nothing like headache is produced. For a few minutes after the cessation of the accommodation phenomena a slight feeling of asthenopia may be felt, lasting only a short time and due to the overstraining and cramp of the ciliary muscle. (Lavagna.)

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Hydrobromate of arecoline employed in glaucoma and in all other cases where an immediate effect on the size of the pupil and on the intra-ocular tension is required. The strength of the solution is 1 per cent., sterilized by heat at 100° C. It preserves its physiological properties and clearness unaltered for upward of a year. Lavagna (La Clinique Opthal., No. 18, '97).

Immediately after the injection of arecoline hydrochloride there is a considerable increase of the amplitude without diminution in the frequency of the cardiac pulsations, which condition persists for several hours. Toxic doses produce the arrest of the heart about two hours after the injection; this arrest takes place in diastole and has a certain analogy to that obtained by Prevost with muscarine. The auricles and ventricles are relaxed and distended by the blood. As a vermifuge or tæniafuge it may also be used with good results; its activity is very great, however, and it must be employed cautiously and the initial dose of 0.015 of a grain must not be exceeded unless it is necessary and the drug is well borne. M. Ricapet (Jour. de Méd. de Paris, Aug. 1, '97).

Administered internally arecoline causes an increase of the salivary secretion and marked diaphoresis. The alkaloid has a powerful sialagogue and diaphoretic action, and markedly stimulates intestinal peristalsis in horses and other animals. It has the same properties as eserine and pilocarpine, but in a higher degree, and the indications for its use are the same. Given hypodermically in doses of from $^1/_3$ to $^2/_5$ grain it is found useful in animals, especially in the treatment of intestinal indigestion. (Mouquet.)

Bromohydrate of arecoline has a sialagogue and diaphoretic action and stimulates intestinal peristalsis in horses and other animals. It has the same properties as eserine and pilocarpine, but in a higher degree, and the indications for its use are the same. Mouquet (Nouveaux Remèdes, Nov. 24, '95).

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Arecoline is a sialagogue of the first rank, which not only is comparable to pilocarpine, but even exceeds it. Salivation occurs in about five minutes after

its injection and attains its maximum in about half an hour. Frohner (Jour. de Méd. de Paris, Aug. 1, '97).

The pulse-rate is lessened, and marked purgation follows its administration.

ARGONIN. — Argonin is a soluble silver-albumin salt prepared by mixing sodium-casein with silver nitrate and adding alcohol until precipitation occurs.

Argonin appears as a fine white powder, soluble in hot water, but slightly so in cold.

Physiological Action.—When applied locally it is non-irritant and does not coagulate the albumin of the tissues. Like argentamin, it is regarded as possessed of considerable antiseptic value.

When administered hypodermically the symptoms of metallic poisoning appear more quickly than with the nitrate, which may be due to the peculiar combination of the metal.

Therapeutics.—It may be used where silver nitrate is indicated; but, up to present writing, definite clinical data are wanting to establish its comparative value. It has been used with success in gonorrhœa and tried in gonorrhœal ophthalmia. In the latter affection it did not seem to be more effective than silver nitrate. The price of the drug is such, however, that it can hardly be had generally.

In gonorrhœa Jadassohn recommended that it be used in the form of a solution of $1\,^1/_2$ parts of argonin to 100 of water. Of this solution $2\,^1/_2$ drachms are injected five times a day, the fluid being retained in the urethra for five minutes after each injection.

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Used with great success in 72 cases of males and 158 females. The urethritis in both sexes rapidly subsides during its use, and the patient is more speedily restored by this treatment than by any other drug extant, as the gonococci are destroyed between two and six days. Bender (Med. Press and Circular, Aug. 12, '96).

Argonin employed in ninety cases of gonorrhœa, eighty being acute. Used in 5-per-cent. solution by the patient as a hand injection, the fluid being held in the urethra five minutes after each injection. Conclusions:—

1. It is absolutely unirritating and can be used in solutions of from 1 to 10 per cent.

2. In the great majority of cases it lessens the discharge very rapidly.

3. Its use is generally followed in a short period by a disappearance of the gonococci.

4. This disappearance of the gonococcus is not in all cases permanent; in other words, there is in quite a large proportion of cases a distinct tendency to relapse, with reappearance of gonococci.

5. It possesses distinct value as a hand injection in the stationary period of the disease, but is of very little benefit in the mucous stage, or stage of decline.

6. It produced no results in the treatment of chronic anterior urethritis. Christian (Ther. Gaz., July 15, '97).

In gonorrhœal ophthalmia occurring in the adult argonin not found as beneficial as the silver-nitrate treatment usually employed. Kalish (N. Y. Med. Jour., Apr. 9, '98).

Thirteen cases of purulent ophthalmia in infants treated with argonin. Three of these had been treated in this way from earliest time of inflammation, and had been cured in 7 days. In the other case the average duration had been 13 days. A carefully prepared 3-per-cent. solution of argonin had been used. A minim dropper having been inserted deep under the eyelid, enough of the solution should be instilled to thoroughly irrigate the eyelids twice and, later, once in the twenty-four hours. Between these applications the lids were kept constantly clean with boric-acid solution. Fifteen grains of argonin contain as much silver as a grain of the silver nitrate. No

neutralizing agent was required after its use. Horace Bigelow (N. Y. Med. Jour., Apr. 9, '98).

Personal use of argonin failed to show any advantage it has over other drugs. C. F. Marshall (Treatment, Jan. 27, '98).

ARISTOL. — Aristol (di-thymol-di-iodide, annidalin), one of the most valuable of the newer antiseptics, occurs in crystals of a light-reddish-brown color, without odor.

It is insoluble in water, slightly soluble in alcohol, and freely soluble in ether and fats. It contains 45.8 per cent. of iodine. It is incompatible with acids, ammonia, corrosive sublimate, metal oxides, alkalies, and carbonates. Heat and light have a deleterious effect upon it.

Dose and Physiological Action.— Aristol is almost exclusively used as an external medicament, but may be given internally in maximum daily doses of 6 grains in cachets.

It may be used externally in the powdered form, and in 10-per-cent. solutions in ether or oils, and in the form of an ointment (10 per cent.). The strength of these preparations may be varied from 5 to 20 per cent.

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Wax and lanolin are the best vehicles for an aristol ointment. If glycerole of starch is used the aristol undergoes partial decomposition with the formation of free iodine. With vaselin there was no decomposition, but the ointment was not very homogeneous. With benzoinated lard there was also a feeble liberation of iodine. With wax and with lanolin no iodine was set free, and the ointment was perfectly homogeneous. These substances are, therefore, best fitted to be used as vehicles for aristol ointment. Fageardie (Jour. de Méd., Dec. 20, '96).

Aristol adheres very readily to the skin, and, therefore, makes an excellent dusting-powder. It is non-irritant to the unbroken skin, but when applied to the mucous membrane it promotes secretion. It is not absorbed either through raw surfaces or mucous membranes, and is therefore free from toxic effect.

When dusted upon wounds or ulcerated surfaces when abundant secretion is present, it serves to dry up the secretions and maintain cleanliness of the dressings.

If the surfaces under treatment be rendered aseptic in the beginning aristol will preserve asepsis.

Its germicidal action is very limited, and its effects on bacteria are negative. Stern (Fortschritte der Med., No. 19, '91).

It was found impossible to destroy cultures of the various cocci and bacilli by the application of aristol alone. If, however, a 10-per-cent. ethereal solution was used and the ether allowed to evaporate, aristol seemed to encapsule the germs and thus hinder their growth. A. Neisser (Berliner klin. Woch., May 12, '90).

Report of twenty-two cases of superficial wounds in which aristol appeared to change septic into aseptic processes. Pollak (Ther. Monat., Dec., '90).

It not only diminishes suppuration, but favors rapid cicatrization.

As a cicatrizant and resolvent, aristol is as inoffensive as it is prompt in its action. Seuvre (Union Méd. du Nord-Est, Feb., '91).

It may be used instead of iodoform, possessing the advantages over that agent of being non-odorless and non-toxic. When given internally it produces no untoward symptoms.

In doses of 37½ grains per kilo weight of guinea-pigs and dogs there was no toxic action discernible. Quinquaud and Fournioux (La Tribune Méd., July 2, '90).

It seems to be eliminated by the urine as an alkaline iodide and, probably, also, as thymol.

Therapeutics.—Aristol is, perhaps, the most popular of the newer drugs by reason of the rapid establishment of its therapeutic uses and the advantages it possesses over others of its class.

Being non-toxic and odorless, it enjoys the distinction of displacing, in very many conditions, the older drug,—iodoform.

Simple Ulcer.—Aristol is of great value when the ulcer has been carefully scraped and disinfected, by actively stimulating cicatrization.

> Report of forty cases in which aristol is considered of great value in the cicatrization of simple ulcers, being more rapid in its action and more readily applied than iodoform. Schmitt (Revue Méd. de l'Est, May 1, '91).
>
> Three rebellious cases in which aristol was both prompt and inoffensive. Seuvre (Union Méd. du Nord-Est, Feb., '91).
>
> Seven cases of varicose ulcers in which the results were good. Previous treatment by rest in bed with applications of carbolic acid, iodoform, and creolin was without avail. Schmitt (Revue Méd. de l'Est, June 15, '90).

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> Series of fifty cases, mostly of suppurating wounds and varicose ulcers, but including some cases of ulcerative adenitis, chilblains, and boils, in which aristol ointment, 4 per cent. to 10 per cent., was used, applied on sterile gauze. In the varicose ulcers the results were impeded by the inability of the patients to take necessary rest. In ulcerating chilblains the action of aristol was especially prompt. Eriberto Arevoli (Incurabili, '96).

Burns.—Striking results have been obtained in cases of burns of the second and third degrees after other remedies had completely failed. Aristol ointment may be used, and the ease with which the dressing is removed and the early cicatrization obtained are noticeable features of this remedy.

Aristol may also be used in the form of powder for the treatment of burns. The surface should be disinfected with a boric-acid lotion, and after opening the vesicles aristol is applied and the whole is covered with sterilized cotton-wool, gutta-percha paper, and a bandage. The application of aristol powder directly to the wound at the beginning hinders the dressing from soaking up the secretion; when the latter has diminished, however, aristol may be applied either alone or in a 10-per-cent. ointment with olive-oil, vaselin, and lanolin.

> Aristol is recommended as of value in burns, the pain being almost instantly relieved and healing being rapid. Haas (Deutsche med. Woch., p. 783, '94).
>
> Case of excessive suppuration of the legs, knees, and soles of the feet, occurring in an engineer as the result of scalding. An ointment of aristol changed the appearance in twenty-four hours, and from this time healing continued steadily and rapidly, an almost absolute cure being obtained in ten weeks. R. Y. McCoy (New Eng. Med. Monthly, Dec., '91).

Wounds.—Aristol has been found of marked value in slight wounds.

> Report of twenty-two cases of superficial wounds favorably treated with aristol. Pollak (Ther. Monat., Dec., '90).
>
> Aristol film recommended for the prevention of secondary peritoneal adhesions. When, in abdominal surgery, the surgeon is obliged to separate extensive adhesions, there is always a dread that secondary adhesions will form shortly, and that the patient will continue to suffer from that source of trouble. The methods of smearing the surfaces of torn adhesions with oil, or filling the abdominal cavity with saline solution, are quite uncertain in the way of good results. When aristol has been dusted upon a wound it shortly forms a film with coagulated lymph, and forms a

mechanical obstacle to the formation of secondary peritoneal adhesions. After separating all abnormally adherent peritoneal surfaces, and waiting until oozing has almost ceased, aristol is sprinkled over the fresh surfaces. After waiting for this to be held by lymph, this process is repeated, and, having formed a film of aristol and lymph over the region of adhesions, the abdomen is closed. Robert T. Morris (Amer. Gyn. Jour., Oct., '91).

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Number of cases of lacerated and contused wounds about the head which healed favorably and with great rapidity. Arevoli (Incurabili, '96).

Skin Diseases.—Aristol has shown itself efficient in several forms of skin disease. In lupus it produces no effect until the ulcerative stage is reached, because of the fact that it has no action upon the unbroken skin and cannot, therefore, penetrate to the seat of disease.

In cases of lupus aristol was found to have an effect only when the nodules had been previously curetted. Neisser (Berliner med. Woch., May 12, '91).

Combined with curetting aristol healed a severe case in five weeks and it remained so ten years afterward. It is thought that the drug has a specific action upon the tubercle bacillus. Gevaert (La Flandre Méd., Feb. 21, '95).

In eczema it has not been extensively tried, but the results obtained would tend to indicate that aristol is of value.

Aristol used as an ointment (10 per cent. to 20 per cent.) in the treatment of eight cases with satisfactory results. Weissblum (Centralb. f. die gesammte Therap., May, '91).

In psoriasis it does not act as rapidly as chrysophanic or pyrogallic acid, but, being always harmless, it may be used with greater freedom and may thus prove more efficient.

Ten cases treated with aristol in which the scales rapidly disappeared without the aid of any other medicament. Schirren (Revue Méd. de l'Est, June 15, '90).

Although it produced good results in twelve cases, conclusion that aristol is inferior to chrysarobin. Stern (Fortschritte der Medicin, No. 19, '91).

In severe cases it was found to be of little or no value. In one case it produced symptoms of irritation on the fourth day. Weissblum (Centralb. f. die gesammte Therap., May, '91).

Hyperidrosis and Bromidrosis.—Used as a dusting-powder in these conditions satisfactory results often follow.

Aristol is regarded cleanly and efficacious in hyperidrosis. In some cases it was combined with iodol in equal parts. Daniel Lewis (Gaillard's Med. Jour., Aug., '91).

Venereal Disorders.—In many of the venereal diseases marked by ulceration aristol is of undisputed value. The majority of observers agree that the virus should be removed from the diseased areas with the curette before application of the drug.

It is useful in chancroids, syphilitic ulceration, and chancre.

Aristol, locally applied, has acted better than other remedies. Rosenheim (Memphis Med. Monthly, Apr., '91).

Aristol tried in the treatment of syphilitic ulcers of various stages. Found of especial value in gangrenous ulcers and in ulcerating gumma of the penis and of the tibiæ. In the typical ulcers of syphilis it did very little good, being inferior to iodol. Salsotto (Gazetta Medica di Torino, Oct. 5, '90).

In soft sores and gonorrhœa aristol found unreliable. Likewise useless in lupus. It did good as an aid after the healing was started by means of scraping; the same favorable results were noticed in other ulcerative processes. Stern (Fortschritte der Medicin, No. 19, '91).

Extensive trial in a large variety of

venereal disorders, employing the medicament either as powder, in ointment, or in collodion. It acted promptly after destruction of the virulence in the infected focus. Aristol found superior to iodoform. Breda (Revista Veneta di Scienze Mediche, Nov., '90).

Aristol acted best in ulcers previously freed from the venereal virus by some caustic, and in adenitis. In balanitis, balanoposthitis, and in initial gummata the drug produced slight effect, although better results were obtained in ulcerating gummata. Segré (Bolletino della Poliambulanza di Milano, Sept., Oct., '90).

Moist condylomata on the genitals of six syphilitic women almost dried up in three days by the use of aristol dusted on their surface. Other syphilitic growths in various parts of the body also did well by this treatment. Seifert (Wiener med. Woch., No. 13, '90).

In ten cases of moist chancres the lesion grew worse under the use of aristol. Schmitt (Revue Méd. de l'Est, June 15, '90).

In the true Hunterian chancre aristol acts injuriously. W. C. Wile (New Eng. Med. Monthly, July, '91).

Diseases of the Eye.—Aristol has been found of value in indolent corneal ulcerations with suppurating base. The powder is thickly applied with a brush and the eye kept closed for a little time. In two days the base of the ulcer is said to become clean. It is also of value in blepharitis.

In a 5-per-cent. ointment it is useful in ulcerative blepharitis, being preferable to the ointment of yellow precipitate on account of its causing less irritation. This ointment has given good results in obstinate recurring hordeola when rubbed into the edges of the lids at night. Heuse (Ther. Monat., Feb., '95).

Valuable in inflammatory diseases of the eye, especially when it is required to suppress a focus of suppuration or repair a loss of substance, as in ulcerous or suppurative keratitis. Antiseptic and harmless. Bourgeois (Union Méd. du Nord-Est, Feb., '91).

Its effects most markedly comprise follicular inflammations of the conjunctiva, phlyctenular disease of the cornea and conjunctiva, marginal blepharitis, ulcers, and after enucleation of the eyeball as a desiccant. In papillary trachoma the drug seems only to aggravate the symptoms. Wallace (Univ. Med. Mag., May, '91).

Two cases of keratitis dendritica, both of which were unassociated with herpetic trouble, and were apparently much benefited by insufflations of aristol. Morton (Annals of Oph. and Otol., Apr., '93).

Useful, after failure of other measures, in clearing base of corneal ulcers; useful as 5-per-cent. salve in ulcerous blepharitis and obstinately recurring styes. Heuse (Ther. Monat., Feb., '95).

Diseases of the Ear.—In affections of the organ of hearing it has shown itself of value when suppurative processes were present.

Twenty cases of suppurative otitis in which aristol proved serviceable. The cavity was first thoroughly cleansed and insufflations practiced. Rohrer (Wiener med. Presse, No. 20, '90).

The drug acts very favorably in acute and subacute internal otitis, and in external ear inflammations. Burkner (Occidental Med. Times, Oct., '91).

Aristol effected a complete cure in twenty-two out of thirty-three cases of chronic purulent otitis, by means of insufflations. Krebs (La Semaine Méd., Aug. 22, '94).

Recommended in suppurating bony cavities and in otorrhœa with large perforation of tympanic membrane. In cases of otorrhœa with small perforations it is dangerous from the liability to block up the perforation and cause accumulation of pus in the middle ear. Gevaert (La Flandre Méd., Feb. 21, '95).

Affections of the Nose and Throat. — Powdered aristol can be blown through the finest tubes to the remotest parts, and it firmly adheres to the mucous membranes. Sneezing or

other unpleasant symptoms are not produced by its use. It increases secretion, and is therefore not to be recommended in the treatment of acute rhinitis or in other disorders in which there is much secretion. In all forms of chronic rhinitis in which the secretions are diminished or absent, the treatment by aristol is more or less successful.

Aristol tried in 11 cases of acute rhinitis, but found valueless. In 9 cases of rhinitis sicca, even when complicated by pharyngitis sicca, the results were good. In 3 cases of rhinitis atrophicans simplex, 6 of rhinitis atrophica fœtida, 2 cases of specific ozæna, with perforation of the septum cartilaginum, and 7 cases of laryngitis, the results were also favorable. Hughes (Deutsche med. Woch., May 1, '90).

Aristol is a more or less useful remedy in the treatment of nose and throat diseases, especially in cases of ozæna. In ozæna, a solution, in liquid petroleum, in the proportion of 40 grains to the ounce, may be employed. W. C. Phillips (N. Y. Med. Jour., May 23, '91).

In atrophic rhinitis, a valuable deodorizer and germicide, possessing, furthermore, the property of being somewhat stimulating and tending to increase the active watery elements of the abnormally inspissated secretions. Insufflated with a powder-blower, after thoroughly cleansing. H. C. Braislin (Brooklyn Med. Jour., June, '91).

Gynæcology. — Aristol has been found serviceable in endometritis, erosions, hyperplasia cervicis, parametritis, and eczema vulvæ. No unpleasant symptoms were produced, though large quantities were used. Iodine could not be found in either the urine or the saliva.

Aristol, in the powdered form or in suppositories, valuable for the relief of chronic vaginitis, pruritus, cervical endometritis, cervical erosions, and fissures. Palmer (Cincinnati Lancet-Clinic, Oct. 3, '91).

In chronic endometritis aristol acts as a valuable alterative, dissolved in a 10-per-cent. solution of albolene. W. B. Chase (Brooklyn Med. Jour., Jan., '94).

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In endometritis, after thorough cauterization of the diseased membrane or curetting, the value of aristol in powder by insufflation is especially to be recommended. No deleterious effects from absorption need be feared and perfect asepsis is assured. Its value in ulcerations of the os and lacerations of the vaginal wall is self-evident. G. C. M. Meier (Times and Register, Apr. 11, '96).

In disorders of children it has been recommended by Moncorvo, who used it externally in more than one hundred infantile cases, the drug being carefully rubbed up in vaselin in variable proportions, and who gave it internally in cachets to tuberculous children, in maximum daily doses of 6 grains. In all these cases it proved a perfect substitute for iodoform, over which it has the advantage, at least for internal use, of being tasteless.

Phthisis.—In this disease aristol has been found more or less valuable when administered hypodermically. It reduced the night-sweats and cough, and the general health was much improved by its use, but it does not seem to merit much confidence.

Subcutaneous injections of aristol in six cases of phthisis, using a solution of 1 per cent. in mild almond-oil, in doses of 15 minims. The injections were not toxic, but very painful, the pain sometimes continuing throughout the entire day. They did not favorably influence the tuberculous process. It is true that in three out of the six cases the sweats were notably diminished, the cough less severe, and the expectoration more watery; but the results were, after all, not encouraging. No great reaction observed. Oehs (Ther. Monat., Jan., '93).

Aristol was employed in progressively-increasing doses up to 24 grains daily, and in increasing concentration up to 15

per cent., in the treatment of various forms of tuberculosis, with satisfactory results in cases not too far advanced. Bernardinone (Riforma Medica, No. 260, '94).

ARSENIC.—Arsenic (As), a native metal, appears as a lustrous, crystalline, brittle mass, of a steel-gray color, without odor or taste. It volatilizes above 100° C. Commercial white arsenic is prepared from the native ore by a process of roasting and sublimation.

White arsenic (arsenic, acidum arsenosum, arsenous oxide or anhydride, arsenic trioxide, As_2O_3), when pure, is a white, amorphous powder, odorless and tasteless. It is soluble in 30 parts of cold and 15 parts of boiling water; also in hydrochloric acid and glycerin. When thrown upon a heated surface a garlicky odor is emitted and the fumes resulting from volatilization are very poisonous.

Preparations and Dose.—Arsenic, $^1/_{60}$ to $^1/_{12}$ grain.

Liquor acidi arsenosi (1 per cent.), 1 to 10 minims.

Liquor potassii arsenitis (1 per cent.—Fowler's solution), 1 to 10 minims.

Liquor sodii arsenitis (1 per cent.—Pearson's solution), 1 to 10 minims.

Liquor arsenii et hydrargyri iodidi (Donovan's solution), 1 to 10 minims.

Arsenii iodidi, $^1/_{24}$ to $^1/_8$ grain.

Arsenii sulphidum, $^1/_{20}$ to $^1/_8$ grain.

Sodii arsenias, $^1/_{24}$ to $^1/_{12}$ grain.

Cupric arsenite, $^1/_{200}$ to $^1/_2$ grain.

SUBCUTANEOUS USES.—Liquor potassii arsenitis, 1 to 4 minims.

Liquor sodii arsenitis, 1 to 4 minims.

Arsenic, in the form of 1 part of anhydrous sodium arseniate to 100 parts of water, the dose being about twice that of Fowler's solution, recommended for hypodermic use. H. N. Moyer (Ther. Gaz., Jan., '91).

Scheele's green, or Paris green, is an impure arsenite of copper.

Clemen's solution—a solution of the bromide of arsenic—is prepared by boiling 57 $^1/_2$ grains each of arsenous acid and carbonate of potash in 8 fluidounces of distilled water and allowing the solution to cool, to which is then added sufficient distilled water to make 11½ fluidounces. To this are added 115 grains of pure bromine. The resulting solution is kept for four weeks, being frequently shaken during the first week, or until it remains clear. Dose, 1 to 5 minims, freely diluted, after meals.

Cacodylic acid (dimethyl-arsenic kakodylic acid), a supposedly non-toxic and easily absorbed preparation of arsenic, is obtained from cacodyl and mercurous oxide in the presence of water ($AsO[CH_3]_2OH$). It occurs in large permanent prisms, slightly sour and odorless; it is soluble in water and alcohol and melts at 200° C.

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Cacodylic acid is said to be non-toxic, and, on account of its solubility, readily absorbable. It was administered in daily doses of 3½ grains and was perfectly well tolerated, while it produced the usual therapeutic effects of arsenic. Daulos (Annales de Derma. et de Syph., No. 6, '96).

When administering arsenic the possibility of intolerance on the part of the patient should be thought of and the first doses should be small.

A patient who, after taking a very small quantity, was seized with a severe attack of diarrhœa and a generalized œdema. He stated that ten years previously he had had a similar attack after simply touching arsenic. All symptoms disappeared after the cessation of the drug. H. Nicholson (London Lancet, Feb. 11, '93).

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Results of experiences with rectal injections of arsenic. It is administered in solution containing $^1/_{20}$ grain in $1\,^1/_4$ drachms. Three injections may be given daily. This treatment may be continued for months without having to be interrupted in consequence of gastric intolerance. Should any rectal irritation be caused the addition of a few drops of laudanum will obviate it. This treatment highly recommended in tuberculosis, especially in the early stage; in diabetes mellitus, and in exophthalmic goitre. Renaut (Les Nouveaux Remèdes, Apr. 24, '98).

Physiological Action.—If moistened and applied to the skin arsenic acts as an irritant, its power as such, however, depending upon the concentration of the preparation. The action upon the mucous membranes is identical.

Arsenic is readily absorbed, and must therefore be used with care.

Arsenic suspended in oil or vaselin is absorbed when applied either under or when rubbed on the skin. Arsenic found in both the urine and fæces. Paschkis (Va. Med. Monthly, Apr., '90).

Subcutaneous injection may be followed by pain, swelling, and even abscess and gangrene.

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Subcutaneous injections do not produce digestive derangements, but they determine local accidents in spite of all aseptic precautions. Arsenical solutions become infected with molds, etc., very readily, and cause irritation at the site of inoculation, pain, inflammatory infiltration, and sometimes even abscess or gangrene. Ziemssen's method of using a sterile solution of arseniate of soda tried, but convinced that the method of subcutaneous injection will not be borne by a patient very long. Vinay (Lyon Médical, Apr. 12, '96).

When administered internally and in small doses, arsenic stimulates the mucous membrane, thereby sharpening the appetite, but no other perceptible effects are produced. It raises the tone of the nervous and circulatory systems and increases the power of endurance.

By combining with the corpuscular elements of the blood these bodies are enriched, consequently the general nutritive forces are improved and the character of the tissues altered.

Literature of '96-'97-'98.

Study made of influence of arsenic on the blood and bone-marrow of rabbit. Conclusions as to its influence on the blood as follows: 1. In the course of subacute arsenical poisoning in the rabbit the number of red corpuscles is reduced, also the quantity of hæmoglobin. 2. A notable change in the number of leucocytes does not occur. 3. There is, however, a relative change of forms, the small lymphocytes increasing, the eosinophiles decreasing. 4. Nucleated red corpuscles appear in the blood during the course of the poisoning. 5. The resistance of the leucocytes, especially the large round-cell forms, is diminished. 6. The resistance of the red corpuscles is diminished; isotomy toward salt solution is increased. 7. Following each injection of arsenic there is a transient rise in the number of red corpuscles: a phenomenon best explained by the entrance into the circulation of erythrocytes. The hæmoglobin in increased, while some corpuscles appear to have an abnormally-high resistance. Regarding the influence on bone-marrow, it is found that introduction of a small quantity of arsenic produces hyperæmia of the cortical, later of the central, marrow, with an accumulation of nucleated red cells and their transformation-forms into erythrocytes. The bone-marrow cells also proliferate; but a part show degenerative changes. The cells with the eosinophile-granules are the least resistant. The progressive changes, in a general way, keep pace with the regressive; when larger doses of arsenic are used the regressive changes predominate over the progressive. Lymphoidization is slower or in abeyance; but

even in severe poisoning an increase of the nucleated red corpuscles can be seen. The changes in the bone-marrow are similar to those in the liver. In the latter there are also progressive changes as well as cell-necrosis. S. Bettmann (Ziegler's Beit. z. Path., 7, B. 23, H. 3, '98).

When taken for a long time the system becomes habituated to its effects; so that much larger doses may be tolerated.

The Styrian arsenic eaters take as much as 8 or 10 grains at once, but take no fluid immediately thereafter, so that absorption progresses slowly and elimination by the kidneys rapidly. This tolerance for the drug is undoubtedly due, to some extent, to environment and heredity, for imitators of the Styrians sooner or later suffer from its toxic effects.

Arsenic, used for a considerable period, produces a tingling and numbness of the tips of the fingers. (Hutchinson.)

Nutrition.—Arsenic, in doses of $^1/_5$ to $^1/_4$ grain, increases the elimination of urea and phosphoric acid and diminishes the elimination of chloride of sodium. In large doses—that is, more than $^1/_4$ grain—it diminishes the excretion of urea and increases the excretion of phosphoric acid and chloride of sodium. In small doses, the elimination of uric acid being augmented, nutrition is increased because the chloride of sodium, the stimulant *par excellence* of nutrition and the preservative of the red corpuscles, is retained in the organism in larger quantities than normal, thus stimulating nutrition, in spite of the loss of phosphoric acid. The contrary is the case when large doses are given, the unfavorable action being attributable, first, to the destructive effect of the drug on the red corpuscles, then to its action on the chloride of sodium, and finally to its action on the phosphoric acid. (Viratelle.)

Large doses are pronouncedly irritant, even causative of gastro-enteritis. The symptoms of such doses are usually slight burning or colicky pains in the epigastrium, nausea, diarrhœa, and, if the dose be sufficiently large, vomiting, purging, and generalized abdominal pain.

Close observation of the patient will disclose a puffiness about the eyes, particularly in the early mornings. This may increase into a decided œdema, and later may lose its local character and become general. The urine may or may not contain albumin and casts.

This puffiness about the eyes should, in the majority of cases, be regarded as the physiological limit of administration.

Nervous System.—Therapeutic doses stimulate, while large or toxic doses depress or even paralyze, the nervous mechanism. The sensory apparatus is usually the first affected, the reflex and motor following in order. The reverse may occur. Authorities agree that arsenic acts directly upon the nerve-centres through changes in the cell-elements.

Literature of '96-'97-'98.

Case of a 15-year-old child of a distinctly neuropathic tendency, with a history of articular rheumatism, who was suffering from chorea minor, the spasm involving the left sterno-mastoid and splenius capitis. Ascending doses of Fowler's solution were ordered until very large doses were taken. At the end of thirty-two days as much as 2 drachms had been ingested, when the patient developed herpes nasalis, and a day later a chill and high fever with herpes labialis, and laryngealis and paræsthesia of one side of the head. Schirlzern (Schmidt's Jahrbücher, Jan., '97).

That the long-continued use of arsenic affects the peripheral nerves is certainly proved by the presence of a wide-spread multiple neuritis in many cases of chronic arsenical poisoning.

Case in which neuritis made its appearance during the treatment of chorea by arsenic. Adams (London Lancet, Feb. 10, '94).

Literature of '96-'97-'98.

Paralysis from the medicinal administration of arsenic. Case of a boy, of 11 years, who, on account of a skin affection, had Fowler's solution of arsenic administered to him in increasing doses. The administration was commenced in January and the first symptoms of paralysis appeared in March. Examination in the following June revealed complete flaccid paralysis in all four extremities, with atrophy and loss of knee-jerks. There was considerable pain on pressure of the muscles and nerves, but no obvious impairment of sensibility. Middleton (Glasgow Med. Jour., '97; Lancet, May 29, '97).

Case of a girl, aged 19, who took by mistake a packet of arsenous acid. Acute symptoms of arsenical intoxication lasted three days. There then supervened symptoms of toxic polyneuritis, which in turn disappeared. Fifteen days later invalid had considerable atrophy of the muscles of the limbs and trunk, motor paralysis, and very pronounced cutaneous and muscular hyperæsthesia. Treatment consisted of hypodermic injections of strychnine, massage, hydrotherapy, electricity, and iodide of potassium, under which the patient gradually improved, but is not yet well. M. Krever (Gaz. Hebdom. de Méd. et de Chir., Sept. 15, '98).

Tingling of the fingers, formications, headache, giddiness, and muscular tremors result from too large a dose of arsenic, while even convulsions may precede the paralysis of a lethal dose. The tendency to give arsenic in large doses, on account of its great value in certain diseases, is leading to the publication of several cases where paralysis has ensued.

Literature of '96-'97-'98.

Case of a woman, aged 38, for whom 30 drops of Fowler's solution were prescribed daily for a glandular enlargement in the axilla. After seven weeks the medicine was stopped on account of diarrhœa and vomiting, which at first had been attributed to the affected glands, which were supposed to be pressing on the solar plexus. It was noticed that she had wasted, and complained of feelings of pins and needles with partial anæsthesia, and œdema of the extremities. She was unable to walk on account of the great pain in her feet. The knee-jerks were lost, the pulse and temperature were raised. Lancereaux (Gaz. des Hôp., p. 911, '96).

Instance of arsenical neuritis in a choreic girl, 10 years of age, who, after the administration of moderate amounts of the drug, developed wide-spread paralysis. H. M. Schreiner (Med. News, Jan. 8, '98).

Case of girl suffering from chorea who took arsenic in 15-minim doses, given three times a day for 31 days, except on 6 of those days. The chorea was speedily cured, and drug stopped; but 13 days after its cessation she began to suffer from symptoms which ushered in peripheral neuritis and almost complete paralysis of all extensor muscles below the knees, with well-marked reaction of degeneration, and some weakness of the extensor muscles of the forearms. She had arsenical pigmentation of the neck and the groins; but under treatment by rest, massage, and electricity she rapidly recovered. Colman (Brit. Med. Jour., Jan. 22, '98).

Skin.—The long-continued use of arsenic is not infrequently followed by changes in the skin. The changes may be in the form of eruptions, pigmentation, etc.

Case of a woman of 40 years, who had taken arsenic for more than a year, in whom the skin became deeply pigmented,

the heels cracked and sore, and the palms and soles very dry. There were also numerous large black freckles on the face. Hutchinson (Archives of Surg., vol. v, p. 364, '94).

Case of brown discoloration of the skin, produced by long use of arsenic, in a boy, 10 years of age, suffering from persistent fever, followed by exophthalmos and thyroid pulsation. The patient took, in two months, 1 ounce of the liquor potassii arsenitis of the German Pharmacopœia. He was discharged improved, but in fifteen days returned, exhibiting a yellowish discoloration of the skin, face, and trunk, which gradually deepened into brown. Foerster (Berliner klin. Woch., Dec. 8, '90).

Two cases of keratosis and melanosis following the internal use of arsenic. E. Heuss (Corres. f. Schweizer Aerzte, No. 10, '94).

Case of diffused pigmentation following the use of ordinary doses of Fowler's solution in chorea. There was no reason to suspect Addison's disease. W. M. Leszynsky (N. Y. Med. Jour., Mar. 23, '89).

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Case in which boils followed the continuous administration of the liquor potassii arsenitis (Fowler's solution) for an old and exceedingly chronic psoriasis. J. Abbott Cantrell (Med. Summary, Mar., '96).

Case of zona due to arsenical intoxication. Coffin (Jour. des Mal. Cut. et Syph., Nov., '96).

Valuable as arsenic is as a medicine in certain ailments, if judiciously used, it occasions, if taken even in small doses for a length of time, not merely a dinginess, but a positive pigmentation, of the skin generally. On the palms and soles it exerts its stimulant action on the sweat-glands, giving rise first to hyperidrosis of these regions, then to the formation of warty corns around the sudoriparous orifices, and, finally, to a diffuse hyperkeratosis, associated with burning sensations. W. Allan Jamieson (Edinburgh Med. Jour., Jan., '98).

Secretions.—In therapeutic doses it facilitates respiration, improves the circulation, and increases the urinary, salivary, biliary, and cutaneous secretions. (Comby.)

Elimination. — Arsenic is very rapidly eliminated, and chiefly by the kidneys. The mucous membranes of the alimentary tract, the skin, tears, and saliva also assist in the process.

Administered hypodermically to the dog in such doses as to produce acute poisoning, arsenic is eliminated by the urine almost wholly unchanged; the elimination, beginning immediately after the injection, is greatest during the first few hours, and continues for three or four days at the most. Even in cases in which small doses are given daily no traces of arsenites are discoverable in the urine; in cases in which rather large doses are given daily for ten or twelve days the elimination of arsenites goes on for a somewhat longer time than stated above. (Severi.)

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Healthy urines of 20 persons in Berlin examined for arsenic with completely negative results. Putnam, in America, found traces of arsenic in 20 per cent. of all urines tested: this is to show that suppression of all sources of adulteration and contamination by arsenic is being satisfactorily accomplished in Prussia. R. Richter (Viertelj. ger. Med., Apr., '98).

Administered by the rectum, arsenic is thrown out by the mucous membrane of the stomach in from one-fourth to one-half hour before the beginning of the elimination by the kidneys. (Kandidoff.)

Poisoning.—Acute poisoning is evidenced in from one-half to three-fourths of an hour by intense burning pain in the œsophagus and stomach, rapidly becoming general over the entire abdomen; an acrid, metallic taste; violent vomit-

ing and purging; excessive thirst; suppression of the urine; collapse; convulsions or coma, and death in from five to twenty hours.

In smaller toxic doses the symptoms are less pronounced and death may not occur for six days.

In some cases profound and rapid collapse without pain has occurred; in others rapidly developing coma, which may be mistaken for cholera. Absence of epidemic and history should eliminate the latter.

As illustrated by the Robinson family (in which, with criminal intent, eight persons were poisoned with arsenic in five years) it is impossible to tell from the symptoms that we are dealing with a case of arsenical poisoning. Certainty can only be reached by a chemical examination, or proof that the poison has been taken into the system. A. F. Holt (Boston Med. and Surg. Jour., Aug. 1, '89).

Arsenical poisoning in children attending a Christmas party. Symptoms finally traced to the burning of candles which were found to contain Scheele's green. (Med. Record, Mar. 30, '89).

Many cases of poisoning have been reported as a result of external application of arsenic. Introduction into the vagina has also caused death.

Death of a woman, aged 53, suffering with cancer, probably from the application of an arsenical plaster to the breast. A positive case also recorded as occurring in 1883, where an arsenical plaster applied to a tumor caused death. C. A. Cameron (Brit. Med. Jour., July 26, '90).

Literature of '96-'97-'98.

Case of a servant-girl, 25 years old, who committed suicide by introducing white arsenic into her vagina. The quantity found in the vaginal canal amounted to nearly 6 grains; in the internal organs $^1/_2$ grain of arsenous acid was found. Deceased had not been pregnant. Haberda (Wiener klin. Woch., No. 9, Mar. 4, '97).

Although the system can easily tolerate gradually increased doses, chronic arsenical poisoning is not of infrequent occurrence from various causes.

Record of twenty-six cases of chronic arsenical poisoning from wall-paper. Especial attention called to the frequent occurrence of albuminuria. James Putnam (Boston Med. and Surg. Jour., Mar. 7, '89).

A case of poisoning from the use of an arsenical ointment given in the treatment of skin disease. During four months the entire amount used was calculated to be equivalent to 20 grains of arsenious acid. R. Krehl (Archiv f. klin. Medicin, vol. iv, No. 44, '89).

Six cases in which jaundice was present in chronic arsenical poisoning. A. Freer (Brit. Med. Jour., Aug. 1, '89).

Case of a patient, aged 50, who had for about twenty years taken $^1/_2$ to $^2/_3$ grain of arseniate of sodium daily. On increasing the dose he suffered from all the symptoms of arsenical poisoning. Inclination to think that the symptoms were due to a peripheral neuritis. Mathieu (Le Prog. Méd., vol. i, p. 244, '94).

Arsenic enters largely into the composition of various articles of domestic economy and was at one time a constant constituent of colored wall-paper. It is often added to common candles to give them a wax-like appearance. It is used in the binding of books, and the dust which collects on the top of the bookcases in libraries often contains considerable quantities of arsenic. It is a frequent constituent of the outside wrapper in which cigarettes and tobaccos are sold, and it is also used in coloring carpets, advertisement cards, playing-cards, India-rubber balls, dolls and children's toys, artificial flowers, sweets, hat-linings, gloves, and a number of other substances. There is an impression that arsenic is a common ingredient of the "face powders"; although zinc, bismuth,

and lead are often present, arsenic is uniformly absent. (Murrell.)

Literature of '96-'97-'98.

A preliminary report as to the presence of arsenic in cigarette-wrappers: Out of seventeen series of different kinds of cigarettes and tobacco, arsenic was present in the labels of six, or more than a third. The arsenic in these cases was present in such large quantities that no difficulty was experienced in demonstrating the fact. Suggestion that, as the inhalation of arsenous acid, even in minute quantities, for a considerable time produces cough, hæmoptysis, expectoration, and loss of flesh, which are readily mistaken for phthisis, the advantage of accurate knowledge concerning this subject is most apparent. Murrell and Hale (Brit. Med. Jour., July 11, '96).

Treatment of Poisoning.—For the *acute* form the most effective antidote is the hydrated oxide of iron and magnesia, prepared by precipitating the solution of tersulphate of iron by magnesia. Twenty grains of the antidote should be given for every grain of arsenic ingested.

A solution of dialyzed iron, the tincture of the chloride, Monsell's solution, or any of the sesquialteral preparations may be substituted in emergencies.

An emetic should be given, or the stomach emptied by the pump, and, if the bowels have not moved, a dose of castor-oil or Epsom salts should be administered.

Demulcent drinks should be freely given, together with stimulation, external dry heat, and friction. Other treatment must be governed by the symptoms as they arise. Opium for pain, and large draughts of water if there be a tendency to suppression of urine, are also indicated.

In chronic arsenical poisoning the patient should naturally be removed from contact with the offending agent and treated symptomatically. Potassium iodide is the most effective agent in such cases.

The pathological changes are those resulting from violent irritation. Hyperæmia, infiltration œdema, ecchymoses, and membranous exudation, which is of a pale-yellow color and adherent to the swelled mucosa, are all to be noted. In the case of poisoning through the introduction of arsenic into the vagina there was acute inflammation, with false membrane on the labia minora and incipient sloughing of the rectal mucosa over the recto-vaginal septum. The labia majora were also very œdematous.

Therapeutics.—Arsenic is well borne by children; but in too large doses, too long continued, it causes anorexia, grave disturbances of digestion, vomiting, diarrhœa, cutaneous eruptions, pallor, and anæmia. Although rarely prescribed before the age of two or three years, recourse may be had to it even in a nursling who has asthma, pulmonary tuberculosis, leukæmia, or pseudoleukæmia, or chronic malarial affections, hereditary or acquired. In older children the indications for arsenic become more numerous, but, as is the case with adults, arsenic should not be given in cases with nephritis, albuminuria, gastro-intestinal dyspepsia (with diarrhœa, vomiting, etc.), or in the acute infectious diseases.

The drug accumulating in certain viscera, the administratioin should be suspended for eight to ten days after fifteen days' use. Arsenic being very irritating to mucous membranes, it should be given well diluted. (Comby.)

Arsenic used extensively in the treatment of diseases of children, rarely, however, before they are 2 years of age. Preference for a solution containing $^1/_{64}$ grain of the arseniate of soda to a teaspoonful of water. The commencing dose is $^1/_{130}$ grain, gradually advancing to $^1/_{32}$

grain at each meal, the medicament being stopped at least eight days a month. Jules Simon (Gaz. des Hôp., Feb., '91).

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Granules of arsenous acid of $^1/_{60}$ grain each are easily taken by children, four or five being administered during the day in bronchial disorders. Comby (Bull. Gén. de Thér., Dec. 15, '96).

Arsenous acid, in doses as large as $^1/_8$ grain a day, recommended in diabetes. Jaccoud (Méd. Mod., No. 14, '98).

Blood Disorders.—After the preparations of iron, arsenic is the best remedy we have in the treatment of uncomplicated anæmia. In pernicious anæmia it is far superior to iron; in fact, the latter remedy sometimes proves hurtful. In leukæmia and pseudoleukæmia it is also very beneficial.

Report of 21 cases of anæmia successfully treated with arsenic: Ten recovered without recurrence; 5 had one relapse; 4 two relapses; and 2 six relapses. Of these recurrent cases, 4 were well at the time of report and 7 died during the relapse, generally from some complication. In leukæmia and pseudoleukæmia the results were not so satisfactory. Arsenic is as much of a specific in pernicious anæmia as mercury is in syphilis. Warfvinge (Trans. Eleventh Inter. Med. Cong., '94).

The iodide of arsenic, administered subcutaneously, in doses of $^1/_{12}$ to $^2/_5$ grain, in leukæmia and pseudoleukæmia. In one case the distended spleen occupied half the abdominal cavity. Results excellent. Rummo (Trans. Eleventh Inter. Med. Cong., '94).

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All the anæmias—chlorosis, lymphatic anæmia, dyspeptic anæmia, and the anæmia of growth—do well with moderate doses.

Pernicious anæmia, leucocythæmia, and pseudoleucocythæmia — diseases showing profound alterations of the blood—must be treated with arsenic. Comby (Bull. Gén. de Thér., Dec. 15, '96).

Chorea.—In this disease arsenic has earned a well-deserved reputation; but the drug must be rapidly pushed to the point of tolerance. Then the doses are gradually decreased, so that at the end of ten to fifteen days the child is saturated with arsenous acid and frequently cured thereby.

Experience has confirmed the value of arsenic as a specific in chorea. It should be rapidly pushed, increasing the amount by 3 minims per dose, t. d., every five days, until a child of ten years is taking 35 minims, t. d., or until vomiting is produced. In chronic cases arsenic in large doses rarely fails to cure when the drug in small amounts has proved useless. It is also serviceable in the grave chorea of pregnant women. J. Sawyer (Birmingham Med. Review, Jan., '88).

When arsenic is badly borne by the stomach it may be administered hypodermically. For this purpose Fowler's solution should be regarded as ineligible because of its irritant properties.

The local irritation following the hypodermic injection of Fowler's solution is due to a small quantity of free arsenous acid in this preparation. It may be avoided by using a pure, anhydrous solution of arsenate of sodium, which was found more beneficial than any other remedy in twenty-eight cases of chorea. H. N. Moyer (Jour. Amer. Med. Assoc., Oct. 7, '93).

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Large doses of arsenic have a beneficial influence in subduing the movements, and this is best seen after the movements have existed for some time,—weeks or months,—that is, when a cure seems almost hopeless. The drug should be given after food, and the little patient should lie down for half an hour afterward in order to avoid nausea and vomiting. Walker Overend (Lancet, July 31, '97).

Infantile Diarrhœa, Cholera Infantum, etc.—Arsenite of copper has proved of great value in the treatment of summer complaint of children, especially in infantile diarrhœas and in dysentery. After administering calomel in minute doses, a solution of 6 to 8 tablets of $^1/_{100}$ grain each, in half a glassful of water, is given in teaspoonful doses every fifteen minutes until six or seven doses are taken, when a teaspoonful is ordered after each operation of the bowels. (Owsley.)

> Arsenite of copper does most good in acute forms of diarrhœa, and especially at the beginning of the disease, no success being obtained in a case that has been in progress for twelve hours. S. B. Overlock (N. Y. Med. Jour., Oct. 24, '91).
>
> The copper salts are powerful germ-destroyers, but should not be given in *all* cases of diarrhœa, the best results being observed in acute cases. H. B. Rue (N. Y. Med. Jour., Oct. 24, '91).

Pulmonary Disorders.—*Asthma.*—Arsenic sometimes proves useful in asthma when administered by the mouth, but it is more effective when inhaled in conjunction with hyoscyamus and stramonium-leaves, in cigarettes.

Phthisis.—The favorable influence upon nutrition exerted by arsenic renders it useful in this disease. Fowler's solution, the most satisfactory preparation, may be given in 1-drop doses at first, the amount being gradually increased to 10 drops. It sometimes proves efficacious in arresting night-sweats.

Malaria.—In the malarial cachexia arsenic comes second in value to the preparations of cinchona. It is especially valuable when the cases have resisted quinine, or when the latter is not well borne; it is also valuable in obstinate fevers complicated with marked anæmia and large spleen. It may also be used as an adjuvant to the antiperiodic alkaloids. Large doses are required.

Arsenic lends itself admirably to the hypodermic method, and is indicated when the salts of quinine are not well tolerated, and arsenic, on being resorted to, is in time not well borne by the stomach.

Arsenic is a valuable prophylactic against malaria. (Downie.)

Neuralgia and Gastralgia.—In these disorders arsenic is sometimes of value, especially when combined with counter-irritation.

> Arsenic is one of the best agents for the cure of simple gastralgia. Recovery is steadily attained in ordinary cases with a pill of $^1/_{24}$ grain of arsenous acid and 2 grains of extract of gentian. Sawyer (Dietetic Gaz., Jan., '88).

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> Favorable opinion of the curative efficacy of arsenic in the various painful neuroses included under the name "gastralgia" in doses of $^1/_{24}$ grain of arsenous acid made into a pill with 2 or 3 grains of some tonic vegetable extract, such as gentian, three times daily half-way between meals. Scarcely any other treatment is needed in cases of moderate severity. It should be continued for some weeks. In severer cases, counter-irritation to the epigastrium added. A varied dietary suits gastralgic patients far better than a restricted one. Trousseau's maxim, that "we should know what a patient does eat before we advise him upon what he may feed," should be followed. James Sawyer (Lancet, July 4, '96).

Skin Diseases.—Acute affections of the skin—especially the acute stage of erythema, eczema, urticaria, and prurigo—are not favorably influenced by arsenic. On the other hand, it represents the most effective remedy at our disposal in the treatment of chronic skin disorders when employed with proper

discrimination. Fowler's solution is generally considered as the most useful preparation. From 3 to 5 drops in a half-glassful of pure water after meals are usually well borne. The dose should be slowly increased until the limit of tolerance is reached.

Psoriasis promptly yields, especially if the treatment is begun by the administration of a saline diuretic, such as acetate or bitartrate of potassium (Rohé)

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Intravenous injections in 28 cases of psoriasis, in 25 of which no other treatment was adopted. Ten were completely cured, 6 were much relieved, and 9 reported as under treatment, but greatly improved. The commencing dose of 1 milligramme of arsenous acid increased daily by 1 milligramme up to 15 milligrammes, the maximum dose, which is repeated daily till the eruption disappears. Herxheimer (La Semaine Méd., clxii, '97).

Eczema also yields to the influence of arsenic, but only when it is employed in the chronic, dry, papular, or pustular stages of the disease. In the moist form it usually proves hurtful.

Acne, when attended by any degree of active inflammation, is aggravated by arsenic; but in the small papular form and that occurring during the menstrual period it frequently proves valuable, when administered in small doses.

Pemphigus is favorably influenced by arsenic when the latter is given in large doses. Urticaria, lichen, and furunculosis are also greatly benefited.

Tumors.—Fowler's solution sometimes retards the progress of epithelioma. It has proven curative in sarcoma and melanoma.

Case of spindle-celled sarcoma at head of tibia cured by internal use of arsenic. Koenigsberg (Deutsche med. Woch., Sept. 23, '94).

Case of malignant melanoma cured by Fowler's solution in 5-drop doses, t. i. d. Lassar (Deutsche med. Zeitung, No. 64, '94).

In cancer the local application of Marsden's paste (2 drachms of arsenous acid and 1 drachm of mucilage of gum acacia) is sometimes effective. A layer of paste one inch in diameter being applied over the growth, a piece of dry lint is applied on the part, overlapping the paste half an inch all around. After ten minutes the overlapping linen is carefully cut away and the paste is allowed to dry. At the expiration of two or three days bread poultices are applied every two hours until the redness and swelling present subside. A true line of demarkation appears, the skin ulcerates, and the fissure formed gradually extends until the cancerous mass comes away.

Case of a woman, aged 28, undergoing treatment for cancer of the breast, after the removal of the epidermis by a fly-blister. Within an hour she began to experience the physiological effects of arsenic: objects seen double or treble and marked tinnitus aurium. Within six hours severe vomiting and diarrhœa, which continued for more than a week. After four weeks she began to lose power in the extremities and rapidly became almost completely paralyzed. There was pain and paræsthesia in the extremities. She began to improve, although incoordination of extremities well-marked. Eight months later the patient was able to feed and dress herself and walk, but she remained an invalid a long time. A. R. Parson (Dublin Jour. of Med. Science, Sept., '95).

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The radical cure of epithelioma by arsenous acid. Arsenic in powder proving abortive, a solution of arsenous acid in equal parts of rectified spirit and water, of the strength of 1 part of the acid to 150 of the menstruum employed. The first step is to thoroughly cleanse the sore by vigorously rubbing or scraping

the raw surface, a moderate quantity of blood being allowed to flow. The surface of the ulcer is then thoroughly moistened with the solution, shaken up before using and allowed to dry, preferably without dressing of any kind. A scab forms, over which the solution is applied daily. The margins of the scab tend to separate from the subjacent tissues; the treatment is continued until the scab is only retained in place by a few loose adhesions. These are divided, the scab removed, and a fresh application of the arsenical solution is made. If on the following day the resulting scab is thin, of a light-yellow color, and easily detachable, it indicates that the tissues no longer comprise any trace of cancerous growth. If, on the other hand, a dark-colored, firm, and closely adherent scab again forms, the whole treatment must be repeated. The thicker the resulting scab, the more energetic should be the treatment: that is to say, the stronger should be the solution, the strength of which may then be increased from 1 in 150 to 1 in 100 or even to 1 in 80. When the desired result has been attained, there remains a granulating wound, covered with a delicate, white pellicle, to be dealt with on general principles. Czerny and Truneck (Med. Press, May 26, '97).

Case of epithelioma, in which recurrence had taken place after surgical interference, treated with painting the growth with Czerny's solution of arsenic, every two days. Cure took place in short time. Borde (Ann. de Derm. et de Syph., No. 2, '98).

Case of epithelioma of face treated with arsenous acid, which was applied to the surface of the ulcer and left exposed to the air, after the method of Czerny. Growth was completely destroyed by third month, and a month subsequent to this period the ulcer had cicatrized. Czerny's method consists in using 3 solutions of arsenous acid in equal parts of water and ethylic alcohol. The first solution is of the strength of 1 to 150, and is applied directly to the ulcerated area. The second and third solutions are stronger and are applied to the scab. The ulcer is touched with a solution every day, and, if the pain of application is severe, hypodermic injections of morphine are given. When the scab drops off, the raw surface is treated as is an ordinary wound. Hermet (Lancet, Mar. 26, '98).

Warts sometimes yield rapidly under the internal use of arsenic in small doses.

Internal use of arsenic recommended for the removal of warts on the hands. The commencing dose for children is ¼ drop three times a day, the quantity being gradually increased. Paul Müller (London Lancet, July 4, '91).

The internal administration of the liquor arsenicalis in the treatment of warts recommended. Report of a number of cases in which great success followed its use, and without any external application whatever. Pullin (Bristol Medico-Chir. Jour., Dec., '87).

Vomiting of Pregnancy.—In this condition arsenic is sometimes of value.

The following formula recommended in the vomiting of pregnancy:—

℞ Acidi arseniosi,
Ext. ignatiæ, of each, ½ grain.
Pulv. ipecac,
Ext. cascara sagradæ, of each, 15 grains.
Ol. gaultheriæ, 2 drops,
M. et ft. pil. No. 20.
Sig.: One pill after meals, the patient being advised to take dry diet, with liquids principally between meals. J. Aulde (N. Y. Med. Jour., '91).

ARTHRITIS. See Joints, Diseases of.

ASAPROL.—Asaprol, introduced into therapeutics by Dujardin-Beaumetz and Stackler, of Paris, is a compound of calcium with the monosulphonate of alpha-betanaphthol. It occurs in the form of a white, crystalline powder, highly soluble in water and alcohol, neutral in reaction, and not altered by heat. Its taste, slightly bitter, becomes immediately sweetish, and therefore renders its use easy in young patients.

Asaprol is incompatible with alkaline iodides, sulphates, and with most of the alkaline salts. Quinine and its salts are also incompatible with it. It is non-irritant, and can be administered in beer, coffee, anise-oil, etc.

Dose.—Ten to 60 grains.

Physiological Action. — Asaprol, though slightly toxic, is well borne by the digestive tract, and the tolerance of the organism for this product is remarkable. It diminishes body-temperature, decreases the pulse-rate, and allays cerebral symptoms. Its administration is frequently followed by more or less abundant localized or general sweating. It is rapidly eliminated by the kidneys, the amount of urine being considerably augmented. The presence of asaprol in the urine is manifested by perchloride of iron, which gives a black or bluish discoloration.

Asaprol possesses a well-marked hæmostatic power, demonstrated experimentally and clinically, which gives it a place beside antipyrine and thallin. Administered in doses from 4 to 45 grains, it has never caused headache, vertigo, buzzing in the ears, nausea, nor vomiting. It has no appreciable influence upon the temperature, warmth, and respiration when administered to healthy children.

Therapeutics. — Asaprol has been found especially useful in febrile diseases.

Typhoid Fever.—The antiseptic virtues of asaprol caused it to be tried in this disease, and it proved itself of value in diminishing the temperature and allaying the cerebral symptoms. When albuminuria presents itself in the history of a case, asaprol tends to induce its disappearance. (Cerna.)

Malarial Fevers.—It has also been found valuable as an antithermic in affections of malarial origin.

> In many cases of malarial fever in children from 15 days old to 12 years the drug seems to have an especial efficacy. The heat is reduced at times very rapidly, a perspiration breaks out over the skin, the diarrhœa is augmented, the liver and spleen are reduced in size, the digestive disorders are relieved, and at the same time the child becomes calmer and sleeps better. Moncorvo (Therap. Gaz., Aug. 15, '95).

Diseases of the Respiratory Tract.—Asaprol has given satisfactory results in the treatment of pneumonia, especially when the cases were accompanied by high fever and delirium. It does not seem to depress the heart's action. In asthma it occasionally arrests the paroxysms. Tonsillitis and pertussis also yield to its action.

Rheumatism.—In rheumatism asaprol has been found useful, but less so than the salicylates. It presents an advantage over the latter drug in being safer as regards the influence upon the heart.

> Asaprol found particularly useful in the treatment of acute and subacute articular rheumatism. Case of rheumatic polyarthritis, occurring in a young servant-girl 17 years of age, and cured in twenty-four hours; another case of the same nature, in a man aged 32 years, cured in an equally short time. Prescribed in cachets of from 7½ to 15 grains each. Staekler (Bull. Gén. de Thér., May 15; '92).
>
> Asaprol is preferable, in some respects, to salicylic acid or antipyrine. Dujardin-Beaumetz (Modern Med. and Bac. Review, Mar., '94).
>
> Successfully employed in cases of acute and subacute articular rheumatism, muscular pains, influenza, and certain forms of asthma and neuralgia, in doses of 1 to 1½ drachms in powder or in aqueous solution. Lewin (Deutsche med.-Zeit., Jan. 28, '95).

It has also been found of service in the treatment of infectious diseases ac-

companied by albuminuria, the albumin soon disappearing from the urine. Solutions of from 2 to 5 per cent. may be employed for gargles, or for vaginal, urethral, and rectal injections. For ointments the strength of 1 part in 3 is used.

ASTHMA (from the Greek, ασθμα; from, ἄω, I blow).

Definition.—A neurosis characterized by more or less severe paroxysmal dyspnœa, due to spasmodic narrowing of the bronchial lumen, alternating with spasm of the muscles of the thorax.

Symptoms.—In the typical form premonitory symptoms—such as uneasiness about the chest, pallor, or a feeling of exultation, due to unusual good health—occasionally warn the patient that an attack is impending.

> Prodromata of asthma: (1) the dyspnœic laugh; (2) repeated sneezing; (3) stridulous laryngitis. Moncorgé (La Loire Médicale, Dec. 15, '95).

Suddenly, in the early hours of the morning in the vast majority of cases, great constriction of the chest and more or less marked suffocation, referred to the sternal region, are experienced. The dyspnœa, in bad cases, almost reaches the stage of apnœa; the respiration is wheezing in the milder cases, but in the others it is scarcely audible. The suffering of such cases is intense; the patient assumes various positions calculated to assist respiration; there is prominence of the eyeballs, distension of the superficial vessels of the neck, blueness of the lips; the skin is clammy and covered with sweat, etc.

The number of respirations per minute is usually reduced and the expirations are very much prolonged. The chest remains expanded; the abdomen is inordinately protruded through the descent of the diaphragm, and its muscles are tense and hard. Percussion gives rise to a drum-like, somewhat high-pitched note over the areas of the chest in which the distension of the alveoli by the imprisoned air is most marked. The cardiac and hepatic dullness outline becomes narrow and occasionally suppressed by the overlying inflated lung.

Auscultation reveals sibilous rhonchi of varying pitch and intensity, following the rhythm of the respiration. They resemble the chirping of birds of different varieties and size, simultaneously heard. This is accompanied or followed by mucous râles.

The variations in the pitch of the notes heard are due to the variations in the diameter of lumina left in the bronchi. Mucous râles are present, absent, coarse, or fine according to the nature of the secretions present. Sometimes nothing but the sibilous rhonchi are heard.

The pulse is usually slow and weak and the temperature is normal in the majority of cases, rarely reaching 100° F. Frequently it descends to 97½° F.

After a period varying from half an hour to several hours the symptoms abate and end by a more or less profuse expectoration of viscid, stringy mucus, varying in opacity according to the severity of the attack.

In a small proportion of cases the fever, cough, and purulent nature of the sputum tend to show that catarrhal bronchitis is present as a complication. It is in these cases that emphysema is most likely to occur later on.

The expectorated substance is found to contain minute angular, octahedral crystals, visible with medium-power lenses, and recognized as the Charcot-Leyden crystals. They are soluble in

warm water, the alkalies, and the mineral acids.

[These properties, as shown by Salkowski, are those of mucin. The association is further supported by the fact that Lœwy found the same crystals in the gelatinous nasal polypus, although asthma was not present. SAJOUS.]

The sputum also contains Curschmann's spirals, which are frequently sufficiently large to be recognized with the naked eye. They consist of a fine, closely-packed layer of epithelial cells arranged in a spiral form around a longitudinal canal-like film. They are usually found in the thickest portions of the sputum.

[These are not pathognomonic of asthma, being also found in the diseases characterized by exudative inflammation of the bronchioles, as shown by Vierordt. SAJOUS.]

By pressing melted wax through a fine hole the spirals of Curschmann are imitated; they are produced when mucus is pressed through the contracted bronchioles; they must, therefore, be considered as a product, not as the cause, of the bronchial spasm. Lisberg (Hygieia, '90).

Spirals of Curschmann are not limited to any particular part of the bronchi, but are absent in the alveoli. The formation of spirals is caused by the whirling of the air during long paroxysms of dyspnœa or violent fits of coughing. Presence of fibrin noted in the sputum of six out of eight cases. Schmidt (Med. Chronicle, Nov., '92).

Large lymphoid bodies and granules, the eosinophile cells of Ehrlich, are also found.

[These also have been found in the contents of mucous polypi. SAJOUS.]

The urine is generally very copious, of low specific gravity, and light-colored. It is usually more toxic after a night attack.

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Essential, or nervous, asthma, the result of toxæmia, occurs more frequently at night, because sleep is in itself a form of toxæmia, urine passed after the night being usually more toxic than urine passed after the day. Huchard (Rev. Gén. de Clin. et de Thér. Jour. des Prat., Feb. 22, '96).

Complications.—The most important complication of asthma is emphysema. This is due to the repeated narrowing of the bronchi, which, assisted by the resulting local congestion, becomes more or less permanent and causes dilatation of the alveoli.

The pulmonary circulation is interfered with and dilatation of the heart and œdema may occur. The conformation of the patient's frame becomes changed, owing to modified action of the muscles of the back and chest. The sufferer stoops and his shoulders become raised.

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Case in which the hands and arms were symmetrically enlarged from metacarpo-phalangeal joints to a point corresponding to the middle of the biceps muscle. Under iodide of potassium and euphorbia the asthma improved somewhat, but the enlargement of the arms remained. John S. Billings, Jr. (N. Y. Med. Jour., May 22, '97).

Differential Diagnosis.—Attacks resembling those of the typical form may be induced by pressure on the trachea, aneurisms, goitre ("thymic asthma"), foreign bodies, vertebral disease, glandular enlargement, growths of the larynx and of the infraglottic space.

They may also be due to irregularity of the bronchial circulation through cardiac disorders, tuberculosis, bronchitis, or narrowing of the respiratory area by mediastinal tumors.

Infraglottic disorders, growths, and syphilis especially may give rise to a form of dyspnœa simulating that of asthma. Sajous (Jour. of Laryn., Rhin., and Otol., Sept., '95).

The great majority of urgent cases of acute stenosis seen occurred low down in the larynx, either in region of true or false vocal cords or below the glottis. Macintyre (Jour. of Laryn., Sept., '95).

Bronchitis. — In children asthma sometimes assumes the character of capillary bronchitis. In all forms of bronchitis there are absence of periodicity, greater amount of expectoration, marked increase in number of respirations, free chest-motion, and more or less fever.

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Case of dry bronchitis with consecutive pulmonary emphysema and asthma in which the Rœntgen rays were employed during an asthmatic attack. The left half of the diaphragm was observed to fall rapidly and rise slowly at each respiration, while the right half of the muscle was altogether motionless. This spectacle continued for several minutes, during which time the peculiar rough breathing could be heard distinctly. Then the patient began to cough, and the right, as well as the left, half of the diaphragm made deep inspiratory and expiratory movement; thick mucus was expelled and the attack was over. The case, therefore, was one of unilateral asthma, and this the author connects with the fact that the bronchial trouble was confined to one lung. Levy-Dorn (Berliner klin. Woch., No. 47, '96).

Pneumonia.—In this disease the respirations are greatly increased in number, and there is panting, besides free chest-motion. There is also high fever.

Croup and Other Laryngeal Diseases.—In these disorders there is interference with the respiration,—inspiratory instead of expiratory.

Emphysema. — In emphysema the dyspnœa is continuous, though liable to exacerbations.

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The dyspnœa of emphysema is too often attributed to asthma. While bronchial asthma of nasal origin occurs when the patient is at rest, and especially at night, the dyspnœa of emphysema mostly appears on exertion. Scheeh (Münchener med. Woch., Aug. 18, '96).

Heart Disease.—Dyspnœa usually follows exercise or becomes greatly aggravated by it in cardiac disorders. In advanced cases the dyspnœa is continuous and the cardiac lesions are easily recognized.

Spasm of the Diaphragm.—In this symptom there are sudden spasmodic expulsive efforts frequently accompanied by hiccough.

Uræmia. — The dyspnœa occurring as a symptom of uræmia is more or less continuous and accompanied by presence of casts in the urine.

Etiology.—Heredity shows itself in about one-half of the cases when three generations are included in the computation.

The influence of heredity is very great; the absence of asthma in the family history greatly increases the chances of cure. Dauchez (Revue Mensuelle des Maladies de l'Enfance, July, 94).

[If collateral diseases dependent upon an arthritic diathesis, rheumatism, gout, migraine, etc., are included as predisposing factors, as taught by Trousseau, almost every case will be found to be hereditary. Sajous.]

Asthma presents itself before the age of ten years in one-fourth of the cases, but it may occur at any period. It is more frequent among males than among females. The wealthy are more prone to it than the poor, owing to dietetic errors and sedentary habits, the latter cause also explaining the disease's predilection for persons deprived of physical exercise, such as clergymen, lawyers, clerks, etc.

Atmospheric influences are active factors in the production of an attack.

Excessive dryness, such as that of overheated or insufficiently-ventilated rooms, or, on the contrary, excessive dampness may bring on a paroxysm. Cases in which a rheumatic diathesis exists are especially sensitive to dampness.

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There exists a particular form of asthma due to autointoxication resulting from the chronic retention of urine. At times there may be present cardiac symptoms resembling those of cardiac asthma, which may be accompanied by sensations of pain in the præcordial region. At other times the respiration assumes a Cheyne-Stokes character. Or there may be present a purely subjective dyspnœa. Whatever character, however, the respiratory troubles of the vesical origin assume, they never assume a type of a bronchial asthma. They never yield to narcotic or cardiac remedies, but disappear, or at least diminish greatly, if care be taken to empty the bladder. J. Pawinski (Sem. Méd., xviii, p. 142).

A patient living on one side of the street may be exempt from asthma, while on the other he may be affected. This may be due to the fact that on one side he lives in a shady room, and on the other is a sunny one. This is a factor of no small moment, in not only the asthmatic, but in all subacute and chronic bronchial disorders. J. B. Walker (Report of Amer. Climat. Soc., Boston Med. and Surg. Jour., Nov. 17, '98).

Pathology. — Various theories have been propounded to explain the dyspnœa, but the prevailing one to-day is that it is due primarily to spasm of the smaller bronchi, as taught by Laennec, Biermer, and Williams, and, secondarily, by spasm of the muscles of the thorax and of the diaphragm, which are unable to cause expulsion of the air imprisoned in the alveoli on account of the restricted lumen of the bronchi.

[The reduction in the number of respirations would tend to demonstrate that the resistance to the egress of air is the main cause of the difficulty. The expired air shows an increase of about 10 per cent. in carbonic acid. It contains little or no oxygen in marked cases, the blood having absorbed all that contained in the increased residual air. This compensatory effort is not sufficient, however, to satisfy the demands of the system for the oxidation of the tissues. Imperfect action of the chest-walls is often due to momentary paresis of their muscular supply induced by the absorption of CO_2. SAJOUS.]

That the spasm depends upon the contractility of the circular muscular fibres of the bronchi and that it is essentially spasmodic in character is the only view by which the phenomena of the disorder can be adequately explained. Wilson Fox (Times and Register, Apr. 2, '92).

Primary spasm of the bronchial muscles leads to a subsequent temporary paralysis, by which the increased demand on the external muscles and the dyspnœa is prolonged. Spasms of the bronchial muscles render the muscles of expiration for a time incapable of performing their functions. Cameron (Brit. Med. Jour., June 1, '89).

[The theory of Salter—that the temporary contraction of the bronchi giving rise to the dyspnœa is due to spasm of the circular muscular fibres of the bronchial tubes—is losing ground. SAJOUS.]

The spasm of the bronchi, by impeding respiration, produces an excess of CO_2 in the blood, which causes abnormal stimulation of the vagi. This action and reaction are further influenced (1) by the reciprocal effects of an accumulation of CO_2 in the central nervous system and a retardation of the circulation; (2) by the rapid production of CO_2 in the organism, in consequence of the powerful efforts required for the movements of respiration. Einthoven (Nederlandsch Tyd. voor Genees., Oct. 7, '93).

There is, besides the narrowing of the calibre of the bronchial tubes, a dilated condition of the air-cells, resulting from venous congestion of the bronchial tract, with consequent excessive accumulation of the gases of the blood in the air-cells and tumefaction of the bronchial mucous membranes by distension of the

venous radicles. The effect of these pathological conditions is interference with and partial suspension of the necessary diffusion between the expired blood-gases, chiefly carbon dioxide, and the inspired air. Illingworth (Med. Press and Circular, Oct. 11, '93).

Asthma, in accordance with the view of Germain Sée, must be considered a bulbar neurosis consisting in an excessive reflex irritability of the respiratory centre. This may be disturbed in its action by a peripheral irritation. Schmiegelow (Chicago Med. Recorder).

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Bronchial spasm is the first, bronchitis the second, and overdistension of the lungs the third manifestation of the asthmatic attack. This overdistension of the lungs disappears more or less rapidly; so that there can be no question of emphysema in the anatomical sense. Schech (Münchener med. Woch., Aug. 18, '96).

Among the various causes of true asthmatic dyspnœa the principal is a defective evaporation caused by a want of sufficient fluid in the epithelial cells of the pulmonary vesicles. This insufficiency of fluid must be attributed to the reflex affection, from various causes, of the vasomotor nerves governing the nutrition of the cells, and produces the same effect as a sudden and considerable reduction in the area of the active pulmonary surface. The convulsive action of the respiratory muscles might easily be a consequence of this dyspnœic condition. (Thèse de Paris, '97).

From examination with the aid of the fluoroscope of four cases of asthma during the paroxysm, it was possible to conclude that spasm of the diaphragm is not the only cause of asthma. H. Schlesinger (Wiener klin. Woch., Apr. 14, '98).

The diminished lumina of the tubes and the paresis of the muscles of the chest-walls may be primarily incited by four classes of factors:—

1. Reflex action, the starting-point of which may be located in the naso-laryngeal tract, the ear, the mouth, the stomach, or the genital organs, etc.

Nasal disease sometimes, though not necessarily, constitutes the inciting factor; asthma associated with nasal polypi observed in 22 per cent. of personal cases, and with chronic rhinitis in 8 per cent. Schmiegelow (Chicago Med. Recorder).

Eighty cases showing that of the three elements which enter into the causation of asthma,—viz., a neurotic habit, nasal disease, and atmospheric conditions,—the nasal disorder outweighs all. Bosworth (N. Y. Med. Jour., Dec. 29, '88).

Out of four hundred cases the superior turbinated, and sometimes also the inferior turbinated, found so swollen as to come near the septum. Torstenssohn (Edinburgh Med. Jour., Jan., '92).

Distressing cases due to retroversion of the uterus and pressure on the sacral nerves; irritation reflected to the pneumogastric. Further attacks prevented by the reposition of the womb. Carpenter (Times and Register, Jan. 4, '90).

Sexual asthma; eleven males and five females. In almost all the male cases there was a history of spermatorrhœa, together with self-abuse and impotence; attacks followed immediately on coitus or other sexual excitement. Peyer (Berliner klinik, Mar., '90).

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Case in which the sputum possessed characteristic features of asthma: Leyden's crystals, spirals, and sago-like pellets, etc. The attacks of asthma and this characteristic sputum were present only during the menstrual period. The patient, aged 32 years, was in every other respect healthy. Katz (Deutsche med. Woch., Dec. 10, '96).

A similar case in which, however, the asthma had not existed previously. The patient, a young girl, having recovered, on the occurrence of the menses the asthma had again developed, and the attacks were limited to the menstrual period. The paroxysms were also called forth by a number of nervous influences, especially of an exciting nature. Von

Leyden (Med. Press and Circular, Dec. 2, '96).

Two cases in which the breathing was characterized by unusual slowness and depth, and amounting in one case to orthopnœa. Cessation of the asthmatic trouble in one case after restoration of a retroflexed uterus. Strubing (Zeitschrift f. klin. Med., B. 30, H. 1, 2, '97).

2. Irritation of the bronchial mucous membrane, in catarrhal processes, by dust of various kinds, metallic (grinder's asthma) or pollen, and the emanations of various plants, fruits, animals, etc., in beings hypersensitive to their action, or of irritating chemicals, — sulphur, phosphorus, etc. (See HAY FEVER.)

3. Irritability of the sympathetic system through the sudden arrest of peripheral disorders,—eczema, urticaria, psoriasis.

Case of urticarial asthma due to mussel poisoning, indicating the relationship between urticarial eruption of the skin and that of the mucous membrane, strongly advocated by Andrew Clark as the main cause of asthma. G. Martyn (Brit. Med. Jour., June 8, '95).

In a large number of patients hyperidrosis antedates the asthma, and relief of the former causes the disappearance of the asthma, as well as of the mucous-membrane complications. Due to the fact that the stockings are continuously wet. Brandau (Archiv f. Derma. und Syph., '87).

Frequent occurrence of asthma among persons who, in their youth, suffered from stubborn cutaneous eruptions. Von Noorden (Zeit. f. klin. Med., B. 22, '92).

4. Irritability of pneumogastric nerve following whooping-cough, measles, or infantile bronchial disorders, or through pressure upon it of enlarged bronchial glands.

In infants the bronchial glands are often the site of congestive and inflammatory conditions following bronchitis, measles, and pertussis, the causes of the attacks being those which produce congestion of the glands, crying, variation of temperature, chilling, etc. Joal (Arch. Gén. de Méd., Apr., '91).

The four above-mentioned factors are able to give rise to the pulmonary and muscular phenomena, owing to the untoward accumulation in the system at large of (1) products of metabolism which fail to be eliminated through hæmatopoietic or renal insufficiency, uric acid, acetone, etc.; (2) extraneous toxics, such as lead, mercury, etc.

An excess of uric acid in the blood contracts the arterioles all over the body and produces high arterial tension. Asthma represents the effect on the thoracic circulation of this high arterial tension, while migraine and epilepsy represent its effect upon the circulation of the brain. A. Haig (International Clinics, vol. iv, '94).

Accumulated acetone acts as a profound poison to the central nervous system. Pawinski (Berliner klin. Woch., Dec. 10, '88).

Epileptic asthma is characterized by varying paroxysms succeeded by health. In many instances these attacks are preceded by pain in the head comparable to an epileptic aura. They come on during the day, and vomiting is a frequent symptom. It is a peculiarity of the affection that it is not improved by the routine treatment of asthma, but is successfully combated with that of epilepsy. This guides us to the adoption of a new line of treatment of remarkable efficacy. Poulet (Jour. de Méd., Feb. 19, '88).

Case in which asthma replaced epileptic fits. The pent-up nerve-storm, instead of discharging itself in the customary channel in an epileptic seizure, expended its energy upon the bronchial muscular fibre, giving rise to the protracted asthmatic phenomena. After many hours it exhausted itself by way of an orthodox "fit," thus bringing the disturbance to a conclusion. Francis Taylor (Lancet, June 10, '92).

Cases showing evident causative influence of malarial poisoning in producing bronchial irritation and asthma, in which quinine caused immediate improvement. Robinson (Med. News, Aug. 31, '89).

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Nervous asthma is usually due to intoxication. The attacks occur at night, because the urine is more toxic then than in the day-time. Huchard (Revue Gén. de Clin. et de Thér. Jour. des Prat., Feb. 22, '96).

Prognosis.—The prognosis of asthma depends upon the nature of its underlying cause. Cases of reflex asthma in which the primary disorder is easily reached and properly treated, — such as nasal hypertrophies, polypi, aural growths, etc.,—are frequently cured and remain so, provided the causative affection does not remain. The prognosis is also good in young subjects with well-formed chests and in whom direct heredity cannot be traced. In all others, however, the chances of recovery are very limited.

Death rarely ensues from spasmodic asthma, but its complications may prove fatal.

Treatment.—The treatment of asthma consists of (1) arrest of the paroxysm; (2) prevention of the paroxysms by measures calculated to annul the effects of exciting factors; and (3) removal of the pathological conditions forming the basis of the paroxysms.

1. Paroxysm. — Before instituting measures calculated to arrest an attack, the nature of the disorder giving rise to dyspnœa as a symptom must be carefully determined. Were a paroxysm found to be due, for instance, to a cardiac affection, the remedies most frequently prescribed—stramonium, belladonna, and the various anæsthetics—would prove dangerous. When the presence of true asthma is ascertained beyond a doubt, the object should be to relieve suffering, and narcotics, or the so-called "depressants," are indicated. Two important facts must be borne in mind by the practitioner, however, namely: the danger presented by all narcotics to give rise to habits of inebriety, and the necessity of giving sufficiently large doses to produce physiological effects if satisfactory results are to be attained.

The bimeconate of morphine, $\frac{1}{4}$ grain by the mouth, or, better still, 10 minims of Magendie's solution, given hypodermically (the dose varying, of course, with the age of the patient), are the most satisfactory agents when rapid effects are necessary, especially if combined with atropia (not more than $^1/_{120}$ grain being given in any case). Codeine may be used instead of the morphine if the latter produces nausea. These remedies present, as objections, however, the partial suppression of expectoration in some cases, and a certain amount of danger in cases of Bright's disease. Strychnia may be advantageously added to stimulate the vasomotor system and equalize the circulation.

Subcutaneous injection of a combination of strychnine sulphate, $^1/_{20}$ grain, with atropine sulphate, $^1/_{200}$ grain, repeated daily or as necessary. Mays (Philadelphia Polyclinic, Jan. 5, '95).

Chloral hydrate comes next in order when prompt relief is required; 15 to 20 grains may be given to an adult. Marked cardiac disorder renders this drug dangerous; the heart should be carefully examined.

Chloroform proves rapidly effective in some cases. Fifteen drops in a half-tumblerful of water to which a teaspoonful of syrup of orange-peel has been added make up a palatable dose. Sulphuric ether, 30 to 40 drops, may be used in the same way, or be administered on a piece of sugar, but the sudden volatilization produced by the heat of the stomach causes eructations which are unpleasant to the patient. Hoff-

mann's anodyne (compound spirit of nitrous ether), 1 drachm in half a tumblerful of pure water, is frequently effective. The dose should be repeated every half-hour.

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During a paroxysm the following is effective:—

℞ Tr. opium, 1 drachm.
Ether, 2 drachms.

M. Sig.: Fifty drops at intervals of one-half hour until the spasm is relieved. Editorial (Journal de Méd. de Paris, Apr. 14, '97).

For the relief of the asthmatic paroxysms a combination of

℞ Morphine sulphate, $^1/_8$ to $^1/_4$ grain.
Strychnine sulphate, $^1/_{60}$ to $^1/_{40}$ grain.
Hyoscine hydrobromate, $^1/_{200}$ grain.

should be given hypodermically at bedtime. In some cases its repetition is unnecessary; in others after two or three injections complete relief from the attack has been observed. Considerable caution must be exercised as to its repetition. S. Solis-Cohen (Phila. Polyclinic, Oct. 9, '97).

General anæsthesia is sometimes employed to advantage, but is not to be recommended unless other means have failed. Chloroform inhalations are the most effective. Ether irritates the larynx and sometimes causes marked distress.

[When general anæsthesia is resorted to, the inhalations should not be vigorous at the start. Severe dyspnœa may otherwise be induced through the laryngeal irritation produced. A preliminary application of a 5-per-cent. solution of cocaine to the nasal cavities greatly increases the efficacy of the anæsthetic inhaled.

Anæsthetics are dangerous in cases of infraglottic thickening, symptoms of which greatly resemble chronic asthma. Hill reported a case in which death very nearly ensued through the use of ether. SAJOUS.]

Iodide of ethyl, 6 or 8 drops, inhaled from a piece of lint. Thorowgood (Med. Chronicle, Mar., '95).

Spray chloride of methyl rapidly over the back of patient. The attack ceases in a few moments; if not, light spraying of upper part of the chest. If the skin is delicate, cover the parts with fine gauze. Tsakiris (Gaz. des Hôp., Mar. 12, '95).

The application to the mucous membrane of the nasal cavities of a 5-per-cent. solution of cocaine is highly recommended by Dieulafoy.

Pure carbonic-acid gas, inhaled for from 5 to 10 minutes at a time, using frequently proves successful. The benefit is probably due to the inhibitory effect of the gas on the laryynx,—an abolition of the reflex sensibility; it appears to cut the paroxysms short when given during the attacks. Weill (La France Méd. et Paris Méd., Mar. 8, '88).

Simple method of manufacturing carbonic-acid gas: In a bottle closed with a rubber stopper, a tube is passed. Three drachms of tartaric acid and four drachms of bicarbonate of soda (sufficient to produce four or five quarts of carbonic-acid) are then placed in the bottle. The patient places the tube in his mouth, and the gas is very easily inhaled on account of its force of expansion. This can also be done with a common glass. Chabannes (La Semaine Méd., May 27, '88).

Dyspnœa and cough quickly relieved by simply inhaling the gas given off from a glass containing a solution of soda bicarbonate and tartaric acid in effervescence. Linossier (Lyon Méd., May 1, '88).

Inhalation of carbonic-acid gas is a useful and innocent remedy; relief continues sometimes for several hours, and even for days. Lépine (La Semaine Méd., May 23, '88).

The smoke obtained from antispasmodic remedies — nitre, stramonium, tobacco, hyoscyamus, and belladonna— is efficacious in cases in which emphysema is not marked.

Cigarettes may be made of paper

soaked in a saturated solution of nitrate of potassium and belladonna. The sheets are allowed to dry, and are then rolled into the shape of cigarettes.

An effective cigarette may also be made of equal parts of lobelia, stramonium, and green tea-leaves, or of stramonium-leaves and ordinary tobacco. Tobacco sometimes proves useful alone where it has not been previously used.

The famous hyoscyamus and stramonium cigarettes of Espic are composed of the following agents:—

℞ Belladonna-leaves, 6 grains.
Hyoscyamus-leaves, 3 grains.
Stramonium-leaves, 3 grains.
Extract of opium, $^1/_4$ grain.
Cherry-laurel water, q. s.—M.

The most active principle in the above combination being pyridine, the cigarette may be replaced by inhalations of the drug, 10 to 15 drops being inhaled from a handkerchief. The following method of using pyridine, however, is the most effective:—

The patient being in a small room, a saucer containing pyridine is put some distance from him. He is allowed to inhale the fumes about half an hour. (Germain Sée, Chicot, Kelamin, Dieulafoy.)

Hyoscyamine, $^1/_{140}$ to $^1/_{120}$ grain, given hypodermically, is recommended by Musser.

Paraldehyde, 30 grains hourly until improvement is noted, is recommended by Mackie and others.

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Paraldehyde used with good effect in about thirty cases of asthma. In the majority the relief was rapid and complete, and in the remainder the distress was lessened. The dose employed was 45 to 60 minims, one dose being usually sufficient, a few cases needing a further dose of 30 to 45 minims an hour or so later. The hypnotic action of the drug, also, is of great service, as in so many cases the attack comes on in the evening or during the night. He has never observed any untoward action of the drug. Frederick P. Hearder (Brit. Med. Jour., Mar. 21, '96).

Case in which a 45-minim dose of paraldehyde caused vomiting and collapse. F. Whitaker (N. Y. Med. Jour., May 2, '96).

Antipyrine, 15 grains being given every three hours until the access is relieved, proves especially effective in anæmic cases.

Antipyrine of great value, but it soon loses its power. It sometimes does harm in increasing the severity of subsequent attacks, particularly in a case associated with bronchitis. Duenas (Revista de Ciencias Médicas, Oct., '88).

Caffeine citrate—1 to 5 grains, dissolved in warm water every four hours—is especially effective in bronchial asthma and in bronchitis associated with spasm of the bronchial tubes.

Citrate of caffeine, 2 grains, in cachet or dissolved in water, every four hours until bronchial spasm is relieved. If attack come regularly in the morning, 5 or 10 grains. Skerritt (Practitioner, Apr., '95).

Literature of '96-'97-'98.

There are two quite distinct forms of the affection, namely: true spasmodic asthma, which is benefited by citrate of caffeine and fuming inhalations, and cardiac asthma, in which ordinary cardiac drugs do good for a time and which later on benefit by oxygen inhalations, whereas fuming antispasmodics do no good. Thorowgood (London Medical Society, Mar., '98).

Glonoin, composed of 1 part of nitroglycerin to 99 parts of alcohol, given in doses of $^1/_{100}$ to $^1/_{50}$ grain, acts rapidly in some cases; but even in these its effects are frequently only temporary. From 2 to 5 drops of a 1 to 100 solution

of nitroglycerin (if there is but little emphysema and no cardiac disorder) are recommended by Woodbury and Hoffmann.

Peroxide of hydrogen, sprayed over the patient, the operator standing at some distance, has been used with success by Warren.

Asaprol, 1 to 1½ drachms in powder or in solution, is a new drug recommended by Lewin. Laborde's rhythmic traction of the tongue might be tried when no remedies are within reach. The organ being held by the fingers, covered by a napkin, it is drawn out at regular intervals, eighteen to twenty times a minute, imitating the respiratory rhythm.

2. Prevention of Paroxysm.—As already stated, the phenomena observed in the chest-walls and lungs may be due to reflex action, the primary factors of which may be located in the naso-pharyngeal tract, the ear, the digestive tract, and the genital organs.

Careful examination of all the organs becomes, therefore, imperative. The nose and stomach are, doubtless, most frequently at fault. In the nasal cavities the lesions met with in the majority of cases are nasal polypus, deflected septum, and turbinal hypertrophy. Active measures to remove any of these abnormalities should be instituted whenever found, although they may not apparently interfere with the physiological functions of the nose.

> Report of 80 cases of asthma examined about one year after active treatment had been instituted: 42 considered as cured and 30 improved. Bosworth (N. Y. Med. Jour., May 26, '92).

That permanent relief is to be expected in one-half of the cases cannot be affirmed. An average of about 20 per cent., however, probably represents the cures obtained by rhinologists at large.

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> Many cases seen in which the removal of mucous polypi or enlarged turbinated bodies from the nasal passages seemed to result in a cure for a time, but the cures were not permanent,—the attack of asthma returned sooner or later. Beverly Robinson (N. Y. Med. Jour., Apr. 19, '96).
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> [The nasal cavities need only present a reduced calibre—through the presence of growths, hypertrophies, etc.—to intensify the manifestation of the disease. An insufficient quantity of air enters the lungs with each inspiration, and the rarefaction within the bronchi and bronchioles (kept up by the relatively exaggerated expansile functions of the chest) keeps up a catarrhal process, which any untoward condition—such as dampness, smoke, pollen, etc.—may suddenly transform into a paroxysm of asthma. The importance of giving the nasal cavities their normal physiological patency by adequate local treatment is thus emphasized. Sajous.]

Disorders of digestion, by serving as preliminary factors of imperfect metabolism, very frequently act as starting-points of paroxysms in asthmatic individuals. Indeed, the majority of patients soon learn that certain articles of food and any indiscretion as to quantity or as to the time of the day at which aliments are partaken of may give rise to an exacerbation of their trouble. Experience teaches them that the greatest discretion should be observed; that easily-digested food should alone be taken, especially toward evening; and that wines and alcoholic beverages had best be avoided owing to their inhibitory influence over the various digestive processes. Gaseous liquids are also pernicious by causing dilatation of the stomach and pressure upon the overlying diaphragm. Butcher's meat, greasy soups,

coffee, sweets, and other substances tending to the formation of urea are contraindicated. Milk, fish, eggs, and vegetables (except beans and rye) should form the bulk of the patient's diet.

> There can be no doubt that uric-acidæmia, when it contracts the arterioles, may practically suspend entirely gastro-intestinal digestion and absorption and allow putrefactive processes to take their place; in this way uric-acidæmia causes dyspepsia. But dyspepsia, on the other hand, will also cause, or increase, uricacidæmia. More or less complete arrest of digestion and absorption promptly causes a fall in urea and a corresponding fall in the acidity of the urine; the alkalinity of the blood is increased, and any uric acid within its reach is at once taken up in solution. Haig (International Clinics, vol. iv, '94).

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> The treatment should, above all, be alimentary. A milk and partly vegetarian diet should occupy the first place. This succeeds where potassium iodide fails. Huchard (Revue Gén. de Clin. et de Thér. Jour. des Praticiens, Feb. 22, '96).
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> In four cases of asthma compression of the pneumogastric nerve, at the surface of the neck, employed. The compression was accomplished by means of a finger and yielded relief within a few minutes, even to complete disappearance of the attack of dyspnœa. A. de Miranda (Sem. Méd., xviii, p. 110).

3. Curative Measures.—The removal of whatever organic disorder that may be present, whether located in the nasal cavities, stomach, genital tract, etc., is, of course, the primary feature of the treatment of a case when the existence of any such disorder can be distinctly established. The chances of cure are greatly increased when a localized affection is present, even if only concomitantly, as successful treatment of the latter entails the removal of a disturbing element of which the sympathetic system at large, and the vasomotors in particular, bear the brunt. Diathetic affections,—syphilis, for instance,—and any of the conditions mentioned of which uricacidæmia is the most prominent type, also require active interference. Considerable improvement, and in some cases cure, may be expected if a proper diagnosis of the primary etiological factor is established and the proper measures instituted.

Underlying the varieties of primary disorders, to which mention has just been made, are others that may be classed as complications. These are usually present whatever may be the primary cause of the disease. Most prominent among these are: 1. The general neurosis forming the basis of the asthmatic paroxysms, which may have assumed a chronic type through depravity of the nerve-centres. 2. Inflammatory lesions of the bronchial tract, which, through the supplementary congestion induced by an unusual atmospheric condition or a dietetic error, may suddenly cause a paroxysm. 3. Malformation of the thorax, — the "barrel-chest," due to excessive distension, which may prevent the expulsion of a sufficient amount of tidal air and interfere with oxygenation,—a condition present in the great majority of cases and a potent element in the causation of suffering.

When, therefore, judicious treatment of any abnormal condition of the upper respiratory, digestive, or genito-urinary tract, or the circulatory and hepatic systems does not yield satisfactory results, it is probably due to the fact that either one, two, or all three of the conditions outlined complicate the case. In the vast majority of cases of long standing the entire symptom-complex is present,—a pernicious cycle that only per-

sistent effort on the part of the physician can command.

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Appropriate treatment should raise the osmotic resistance of the cells that govern the lymph-transudation in the alveoli and capillaries, so that they will withstand the influences exerted upon them by the changes in the barometric pressure and other atmospheric conditions, annul the inflamed state of the bronchial walls, and establish a normal state of the mucous membrane and glands of the bronchi and the epithelium of the alveoli, as far as the pathological changes admit. J. C. Bowie (Edinburgh Med. Jour., May, '97).

The neurotic asthenia may be said to be present in all cases of asthma. This is met most satisfactorily by strychnia in increasing doses, beginning for adults with $^1/_{60}$ grain after each meal and gradually bringing the dose up to $^1/_{20}$ grain, during a period covering two months.

The case should, of course, be carefully watched, and, if the physiological effects of the drug appear, the dose of strychnia should be reduced. Static electricity, by stimulating the peripheral vasomotors, greatly enhances the action of the strychnia, and, in fact, is a necessary accompaniment. Daily sittings of fifteen minutes each are required to sustain the beneficial effects obtained.

When bronchial lesions are present,—they are invariably discernible in true asthma,—the treatment should begin by a course of iodide of potassium, rapidly increasing the dose from 5 to 30 grains three times a day. To avoid, as much as possible, gastric disturbances, it should be administered in not less than a half-tumberful of pure water at first, and in a tumberful when larger doses are to be taken. Fowler's solution, 3 minims three times a day, generally counteracts the eruption and other unpleasant effects of iodide of potassium, and should be administered simultaneously if need be. After a couple of months the strychnia and static electricity course may be begun. Iodide of potassium is contra-indicated in cases in which there is a tendency to hæmoptysis, or when there is an infraglottic disorder.

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Atropine strongly recommended in bronchial asthma. The dose at first is $^1/_{120}$ grain daily by the mouth; the dose is increased by this amount every two or three days until the daily dose of $^1/_{16}$ of a grain is reached. Then the amount is gradually diminished, the duration of the treatment averaging four to six weeks. This should be repeated every six months, but throughout less time and with smaller doses. Carl von Noorden (Ther. Monats., H. 10, S. 539, '98).

If the opinion of Landouzy that true asthmatics not infrequently have an element of tuberculosis is well founded, there is reason to think that other toxins also may promote the asthmatic symptom-complex, and especially the streptococcus toxin. Hence an explanation of the cure of asthma in certain cases by antistreptococcic serum. Boucheron (Tribune Méd., May 4, '98).

The barrel-chest, when due to the disease, is only met with in advanced cases. But, whether present or not, the conditions acting as its causes are generally present,—namely, weakness of the muscles concerned in the performance of the respiratory act, including the diaphragm. The treatment of all cases of asthma should, therefore, include measures designed to increase nutrition of these muscles and the activity of their nervous supply. Strychnia fulfills the latter objects, but it must be assisted by complementary measures designed to localize, as it were, its beneficial influ-

ence. For the superficial muscles of the chest, massage, first along the intercostal spaces, then over the large muscles, the deltoids especially; the outline of the muscles should be borne in mind and the active pressure exerted along the muscular fibres toward the arterial trunk supplying each set. For the diaphragm the faradic current alone is of service, the negative pole being applied over the course of the phrenic nerve just above the clavicle and the positive over the xiphoid cartilage. The sponges being fully moistened with salt water and applied, the patient is directed to empty his lungs of air, then to *only inflate them partially,* and to continue this restricted respiratory act during the entire sitting, —about five minutes at first, then ten minutes. The oftener this procedure will be undertaken, the sooner will satisfactory results be attained. At home the patient will enhance the effects produced by a daily calisthenic exercise, consisting in bringing the fists up to the shoulders and approximating the elbows anteriorly as much as possible with each expiration. Chairs have been invented by means of which the exaggerated expansion of the thorax may be counteracted.

Manipulation, — pressure, combined with a very limited degree of rotary motion. Orrick Metcalfe (Medical Record, Jan. 12, '95).

Posterior portion of chest rapped quite violently until the entire thorax is set into violent vibration. This improves the circulation, favorably influences the emphysema, and betters the nutrition of the lung. Goebel (Deut. med. Woch., Apr. 7, '92).

Asthma is due, in part, to a deficient supply of oxygen to respiratory centres; training of respiration, carried out by practicing respiratory movements needed to carry tidal air through the lungs, is recommended. Marcet (Lancet, July 13, '95).

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When a fall in the barometric pressure takes place, the asthmatic subject develops and passes through a series of symptoms of an identical nature to those which are observed when men are suddenly removed from additional atmospheric pressures to the normal. This force, which differs so vastly in its intensity, established a series of symptoms which vary only in their severity and immediate results. Should death take place under any of the conditions mentioned, and the post-mortem appearances be compared with those observed in death from carbonic-acid poisoning direct, their further identity will be apparent. J. C. Bowie (Edinburgh Med. Jour., May, '97).

In case of hysterical diaphragmatic asthma faradization of the phrenics and practice in voluntary respiration were soon followed by improvement, but the dyspnœic motions returned whenever the patient felt he was being observed. Finally, complete recovery was obtained. E. Barth (Berliner klin. Woch., Nos. 42, 43, '98).

As a result of clinical observation, following conclusions reached: 1. The spasm of the respiratory passages may be produced voluntarily by the majority of asthmatic patients and by many normal individuals. 2. Almost all asthmatics can control the spasms even during an attack, but certainly during the period of remission. 3. The muscles of the respiratory passages are either under the control of the will or may be brought under such control. As a consequence of these conclusions the importance of respiratory gymnastics for asthmatic patients is patent. The number of respirations per minute must be reduced and expirations performed slower and more completely. The spasm of the muscles will thus be controlled. The speech must be regulated and while speaking the patient must inspire slowly and deeply. The asthmatic must learn to maintain the proper tension of the muscles of the neck, chest, and abdomen. Talma (Berliner klin. Woch., No. 52, '98).

Personal method of treatment in those cases of asthma combined with cardiac

dilatation consists in a modification of the Schott treatment with the inhalation twice daily of free oxygen-gas. The gas seems to relieve the paroxysms by supplying the oxygen of which the system is in need. Kingscote (Medical News, May 21, '98).

Compressed air, the patient being placed in pneumatic air-chamber in which the air has been condensed, is of great value in bronchial asthma and secondary emphysema. Unfortunately, the apparatus required is so bulky and expensive that it is hardly ever at the disposal of the physician. Expiration into rarefied air is of signal value in spasmodic asthma, the apparatuses of Waldenburg and Solomon Solis-Cohen being especially efficient for the purpose.

Rarefied compressed air used to a considerable extent, invariably with excellent results. Contra-indications: Valvular disease of the heart, extensive cardiac dilatation, fatty degeneration of the heart, or atheromatous degeneration of the arteries. Williams (Amer. Jour. of the Med. Sciences, Aug. 5, '95).

[I employ the Guillemin hydraulic apparatus, owing to the fact that no weights are required and because its diminutive size causes it to occupy but little room as compared to other instruments. SAJOUS.]

Strophanthus, 10 grains three times a day, has been credited with curative properties, but the best that can be said of this drug is that it seems to lengthen the interparoxysmal periods.

Strophanthus, in 10-grain doses, lessens the excitability of the vagus, given three times daily at intervals for some time; arrests asthmatic attacks for a long period. Drzewiecki (Le Bull. Méd., Jan. 22, '90).

Intralaryngeal injections for the purpose of reducing the catarrhal process of the bronchial mucous membrane have been followed by satisfactory results.

Literature of '96-'97-'98.

Intralaryngeal injections of the following solutions are used, the quantity of the solutions injected and the amount of the agents contained in each injection being in accordance with the patient's age and condition. One drachm will be sufficient for a child from 5 to 10 years of age, 2 drachms from 10 to 15; after this, from 3 to 5 drachms will suffice at each sitting.

First solution: a 5-, 10-, 15-, or 20-per-cent. solution of menthol in almond-oil.

Second solution: 2 to 5 minims of a 2½-per-cent. solution of pure crystals of iodine in almond-oil, added to each drachm of the first solution.

Third solution: 5 minims of a 10-per-cent. solution of oil of hops in almond-oil added to each drachm of the first. J. C. Bowie (Edinburgh Med. Jour., May, '97).

When the asthma occurs in connection with pregnancy viburnum prunifolium is a valuable remedy. If there should be any indication of abortion, chloral-hydrate may be administered simultaneously.

In asthma during pregnancy marked improvement from the constant use of viburnum prunifolium; lessens the irritability of the uterine tissues. Davis (Jour. of the Amer. Med. Assoc., May 25, '89).

Climate is thought to bear considerable influence upon the explosion of asthmatic paroxysms. The fact is that very few cases are permanently cured by a change of residence, and that practically all are momentarily benefited by any change they may make. Thus, removal from the purest mountain air to the dusty air of a large city is fraught with momentary relief. It is probable that the change of diet and habits has much to do with the result attained, unless the paroxysms are greatly under the influence of bronchial catarrh, when the removal from a cold and damp climate

to a warm and dry one may prove of lasting benefit.

Literature of '96-'97-'98.

In seeking for a climate it is well to remember that for a time immunity from attacks may be apparent, but finally acclimatization takes place and the symptoms reappear. Brügelmann (Ther. Monat., H. 2, S. 74, '97).

Case of a physician who changed his residence and practice several times during his life, on account of asthma, and who finally got relief by going back to the place from which he started. F. I. Knight (Boston Med. and Surg. Jour., Mar. 25, '97).

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ASTIGMATISM.—From Gr., α, priv.; and στίγμα, a point. This word, proposed by Dr. Whewell, has been adopted, with slight modification, in all modern languages.

Astigmia, from α, and στίγμή, is proposed to replace it, as being etymologically better and shorter, although some of the derivative words would be longer. Georges Martin (Ann. d'Oeul., Mar., '95).

Definition.—That error of refraction by reason of which rays, coming from a single point and passing through the refractive surfaces of the eye, are not turned toward a single point, and, therefore, cannot be perfectly focused on the retina.

Irregular Astigmatism.

Definition. — The form of astigmatism arising when one or more of the refractive surfaces of the eye is irregular; so that, rays passing through different parts of these surfaces are turned in various directions and can never be brought to a perfect focus.

Symptoms.—There is imperfect vision, the blurring being proportioned to the degree of the defect and the size of the pupil, and affecting the seeing at all distances and all times. An eye subject to this defect is permanently "weak," cannot attempt work requiring very accurate seeing, and is liable to be strained in reading, sewing, etc. The irregularity of surface is generally accompanied by more or less haziness or opacity. This may be the opacity remaining in the cornea when irregular astigmatism has been caused by corneal inflammation, or it may be an opacity of the lens, when such astigmatism is the forerunner of cataract.

Pronounced irregular astigmatism causes *monocular diplopia,* or *polyopia.* A lamp-flame or the moon at night is seen multiplied, the different images of it usually overlapping each other more or less. It also shows itself by the distortion of letters, and in the appearance of additional lines about or upon them, plain type being made to appear like fancy type. The "rays" which appear to proceed from a point of bright light, as a star or a distant electric lamp, are due to irregular astigmatism. An eye free from astigmatism would see a star as a mere point of light.

Etiology. — Some irregular astigmatism is present in all normal eyes. When it causes no impairment of vision, below the usual standard of 20-xx, it is called normal. Normal irregular astigmatism is generally caused by the inequality of curvature in the periphery of the dilated pupil, this being cut off when the pupil contracts.

Even when not excluded by the iris, such astigmatism may not cause imperfect vision, because the distinct retinal image may be formed from a small part of the light entering the eye; and, while additional unfocused light renders accurate vision slightly more difficult and tiresome, it does not prevent it. E.

Jackson (Jour. of Amer. Med. Assoc., Sept. 1, '94).

The form of irregular astigmatism in which rays piercing the cornea in the same meridian, but at different distances from the centre, are differently refracted, while rays piercing it in different meridians, but at the same distance from the centre, are equally refracted, is called the "symmetrical aberration" of the eye. It is "positive" if the rays are most refracted at the edge of the pupil. This commonly depends upon increased curvature of the periphery of the lens. It is "negative" when the rays are least refracted at the edge of the pupil, from the flattening of the periphery of the cornea. Conical causes a form of high negative aberration. E. Jackson (Trans. Amer. Ophthal. Soc., '88).

Irregular astigmatism may be due to irregularity of the surface of the cornea, as from abrasion or superficial ulceration.

Irregularity of the corneal surfaces and of the layer of mucus covering the cornea, which acts as a portion of the cornea in the refraction of light, may be caused by partial closure of the lids, with pressure of the lid-margins upon the cornea,—that constriction of the lids which is designated in French *clignement*. The lid-margin resembles, somewhat, the rubber scrapers used for cleaning windows, and constriction of the lids causes this prominent margin to make a groove on the cornea. Brief constriction merely displaces the viscid covering of the cornea, and irregular astigmatism due to it disappears with a single sweep of the lids in winking. Prolonged constriction causes a groove in the corneal substance, the effects of which are rendered more evident by winking, and which is quite slowly effaced. George J. Bull (Trans. Eighth Inter. Oph. Cong., p. 107).

General bulging of the cornea is commonly not uniform and gives rise to irregular astigmatism, the common form being conical cornea; but the most common cause is incomplete restoration of the corneal tissue to normal after keratitis.

Treatment. — With irregular astigmatism following keratitis there is always, at first, haziness of the cornea; and, probably, remedies for corneal opacity improve vision partly by lessening irregular astigmatism.

Conical cornea, if extreme, may be greatly improved by making a paracentesis at the apex of the cone with galvano-cautery needle. In one case vision improved from $^{4}/_{200}$ to $^{20}/_{50}$ with lenses. R. D. Gibson (Trans., Section on Oph., Amer. Med. Assoc., '92).

In a few cases dilatation of the pupil may improve vision by admitting light through a better portion of the cornea or crystalline lens. Iridectomy is applicable in some cases for the same purpose. Contraction of the pupil often makes vision better by lessening the areas of diffusion. Solutions of pilocarpine, 1 to 500, or eserine, 1 to 2000, may be instilled for this purpose. Stenopaic spectacles improve vision, but interfere too much with the field of vision to be of much practical value. Hyperboloid lenses have been used for conical cornea, but rarely with enough advantage for the patient to continue their use. For the mass of cases the correction of regular astigmatism commonly associated with the irregular, and the use of spherical lenses that will prevent the straining of accommodation, is the only available optical treatment.

Regular Astigmatism.

Definition.—It is the astigmatism that can be corrected by a cylindrical lens.

Symptoms.—It causes the blurring of some or all lines looked at. The eye is able to see with perfect clearness only the lines running in one direction at any one time, although by changing its ac-

commodation it may be able to see clearly lines running at right angles to the first. These two directions in which lines may be seen clearly, the "principal meridians," may be perceived by the patient, although usually they are only recognized when the eyes are carefully tested. A certain adjustment of the power of accommodation renders lines equally blurred in all directions. Astigmatism may thus cause imperfect vision; but very often the imperfection has never been noticed by the patient. Generally some form of eye-strain, from the effort to focus clearly the lines running in the different directions which all objects present, or to recognize from imperfect retinal images the real form of an object, gives rise to the symptoms complained of. These are weakness of the eyes, headache, pain in the eyes on use, inability to use them long, excessive lacrymation, photophobia, nervousness, twitching of the eyelids, and even more serious nerve disease.

Astigmatism usually co-exists with hyperopia and myopia, and a portion of the symptoms may be due to one of these.

> In the majority of cases with low degrees of hyperopia it is sufficient to correct the astigmatism, and the correction of astigmatism removes the troublesome symptoms that were assumed to depend on muscular insufficiency. D. B. St. John Roosa (Ophthal. Review, Oct., '91; Annals of Oph. and Otol., '92).

> The correction of astigmatism alone many times may give marked relief, but it is better to give full correcting glasses so that the refraction of the dioptric system including the glasses show approximate emmetropia. S. D. Risley (Annals of Oph. and Otol., July, '92).

The eye-strain caused by astigmatism is probably a very important factor in the development of myopia.

> Among 2000 eyes 9 per cent. were simply hyperopic, but only $^1/_3$ of 1 per cent. showed simple myopia. In the other myopic eyes there was also astigmatism. F. W. Marlow (N. Y. Med. Jour., July, '95).

> The correction of errors of refraction, particularly astigmatism, has greatly decreased the prevalence of myopia, particularly of high myopia. In Philadelphia in the last twenty years the percentage of eyes requiring myopic corrections is diminished from 25.4 to 15.2 per cent. S. D. Risley (Trans. Amer. Oph. Soc., vol. vii, p. 168).

> Among 869 patients, about 70 per cent. of whom had astigmatism, there were 60 per cent. suffering from headache, 20 per cent. aching and pain in the eyeballs, 11 per cent. twitching or spasm of the lids, and 11 per cent. had inflammatory symptoms. H. Bert Ellis (Trans., Section on Oph., Amer. Med. Assoc., '95).

> Among 4000 cases of ocular headaches, 73 per cent. had astigmatism. Patients with high degrees of astigmatism are apt to go through life without complaining of eye-strain; while a larger number of persons suffer who have only the lowest degrees of astigmatism. This may be partly because low degrees of astigmatism are more common than the high degrees; and probably, also, because those with high astigmatism early learn to save their eyes, while persons who are able to see perfectly use and abuse their eyes more freely. W. F. Mittendorf (Trans. Amer. Oph. Soc., '95).

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> In recent examination of personal casebook it was noted that a large number of cases that had been examined a few years ago recently on re-examination showed marked changes in the astigmatism. In some cases a change from emmetropia to myopic astigmatism had occurred, others of gradually-increasing myopic astigmatism, and still a third class in which there had been an increase in the hypermetrophic astigmatism. Hotz (Phila. Med. Jour., July 16, '98).

Many observers believe that astigmatism against the rule, or astigmatism

with the meridian placed obliquely, causes more annoyance than astigmatism of the usual form, in which the meridian of greatest refraction is vertical. This latter may be due to the fact that the astigmatic eye can see perfectly only the lines that run in the direction of one of its principal meridians, and that most of the lines which we wish to distinguish are either vertical or horizontal.

> The eye with oblique astigmatism sees vertical and horizontal lines rotated, and for the two eyes to work together in binocular vision this rotation of the images must be compensated by rotation of the eyeball through symmetrical action of the oblique muscles. Such an action may cause symptoms of eye-strain. G. C. Savage (Oph. Record, July, '91).
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> In any given cases of astigmatism lines perpendicular to each other have their images rotated in opposite directions. It is, therefore, impossible by rotation of the eyeball to make all the lines of the image in one eye correspond to the lines of the image in the other. Compensatory rotation of the eye is, therefore, only necessary when the lines running in some one direction are decidedly predominant over lines running in other directions. H. Wilson (Arch. of Oph., July, '94).

Uncorrected astigmatism has been regarded as interfering with the use of various optical instruments.

> A careful consideration of the optical theory of the microscope shows that, on account of the "penetrating power" of that instrument, astigmatism interferes but little with its use. Only when the astigmatism is of high degree and a low power of microscope is employed is it necessary to consider it at all, or resort to correcting lenses. With the high powers of the microscope even the high grades of astigmatism cause no distortion or blurring of the image. Woodruff (Jour. Amer. Med. Assoc., Nov. 24, '94).

Etiology.—Astigmatism is caused by a lack of symmetry in the curvature of the refracting surfaces of the cornea or crystalline lens, or an oblique position of such surfaces with reference to the visual line. The statement still sometimes made, that obliquity or distortion of the retina is capable of causing astigmatism, merely betrays the ignorance, of him who makes it, of the nature of the defect. Astigmatism caused by the cornea may be partly or wholly corrected by an opposite astigmatism caused by the crystalline lens. The wide use of the keratometer (ophthalmometer) of Javal has furnished extended statistics regarding corneal astigmatism, which, by comparison with the total astigmatism of the eye, also indicates the astigmatism due to the crystalline lens.

> Examination of 500 eyes with the ophthalmometer showed that in 6 per cent. of all cases the corneal astigmatism corresponded with the total astigmatism both as to amount and as to the direction of the principal meridians. In 16.6 per cent. additional the amount of corneal astigmatism exactly equals the total, and in 41.6 per cent. the difference equals 0.50 dioptre or less. Of the 77.4 per cent. in which corneal astigmatism does not correspond with the total, the former is in excess in 62 per cent. and the latter in 15.4 per cent. In 34.6 per cent. the instrument indicates the direction of the total astigmatism. E. Jackson (Annals of Oph. and Otol., Oct., '94).
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> In 150 eyes affected with astigmatism the amount measured by the ophthalmometer was greater by 0.50 dioptre, on an average, than that found subjectively by glasses, during paralysis of the accommodation by atropine or scopolamine. Andogsky and Dolganoff (Ann. d'Ocul., Nov., '94).

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Yielding of the sclerotic to intra-ocular pressure does not always occur at the posterior hole of the eye. In most cases of astigmatism there is evidence of this yielding at some portion of the globe, and the corneal astigmatism is secondary to this. Where the astigmatism is very

high, the yielding of the sclerotic is chiefly lateral and localized. And, in cases of conical astigmatism in which the surface of the cornea is distorted so as to approach the surface of a cone with its apex to one side, the staphyloma is to be found in the neighborhood of the cornea. R. D. Batten (Oph. Review, Jan., '97).

Measurements of 4270 eyes with the ophthalmometer show that, on the average, the refraction of the vertical meridian is about 0.78 dioptre greater than the horizontal, and that ⅞ of all eyes show corneal astigmatism of between 0.25 and 1.25 dioptre Astigmatism of high degree is apt to be associated with other abnormalities, is unequal in the two eyes, and has its meridians obliquely placed. There is, also, a marked tendency to heredity of the corneal curvature and astigmatism. A. Steiger (Arch. of Oph., p. 254, '97).

The direction of the principal meridians of astigmatism have been frequently studied in the hope of throwing light on the etiology of the defect.

In 2500 cases the direction of the principal meridians were found: symmetrical in 1307 cases; asymmetrical in 458; heteronymous—that is, one meridian at zero and a corresponding meridian of the other eye at 90°—in 173 cases; and homonymous—that is, with the principal meridians parallel, but neither vertical nor horizontal—in 41 cases. In the cases of symmetrical astigmatism the meridian of greatest curvature was found vertical in 57 per cent.; within 15 degrees of vertical in 20 per cent.; horizontal in 12 per cent.; and within 15 degrees of horizontal in 4 per cent. S. D. Risley and J. Thorington (Trans. of Sec. on Oph., Amer. Med. Assoc., '95).

In 1000 cases of binocular astigmatism the meridian of greatest curvature was vertical in 60 per cent. and symmetrical in the two eyes in 84 per cent., while, if differences of 5 or 10 degrees in direction had been disregarded, the proportion of cases of approximate symmetry would be considerably higher. H. Knapp (Trans. of Amer. Oph. Soc., '92).

Extensive wounds or incisions of the cornea give rise to permanent change in the corneal curvature and astigmatism. This is most noticeable after cataract extraction. The astigmatism is highest a few days after the corneal wound has closed, and from then on slowly diminishes until usually within three months, but sometimes later, it becomes stationary. The changes of corneal curvature are flattening of the cornea at right angles to the incision, and increased curvature in the direction of the line joining the ends of the incision.

This is the natural result of diminished resistance along the line of the incision, allowing cornea to give before the intra-ocular pressure and bulge at this point. E. Jackson (Trans. Pan-Amer. Congress, vol. ii, p. 1430).

Literature of '96-'97-'98.

After operation the astigmatism diminishes by the increasing approximation of both meridians to their curvature before operation. With complicated wounds the astigmatism is always greater, and the decrease from the original amount is less than in cases of normal healing. The chief causes of traumatic astigmatism are the intra-ocular pressure and the tonic contracture of the extrinsic ocular muscles. W. Dolganoff (Arch. of Oph., p. 250, '97).

Case in which a marked temporary change in the astigmatism had been produced by pressure of a chalazion. Norton (Phila. Med. Jour., July 16, '98).

Belief that cocaine has the effect of producing transient astigmatism. Grigg (Phila. Med. Jour., July 16, '98).

Attention called to the temporary astigmatism, often considerable in amount, that accompanies blepharitis and is due to lid-pressure. Wurdemann (Phila. Med. Jour., July 16, '98).

Diagnosis.—Astigmatism is detected and measured by all of the various methods of determining the refraction of the eye, and should be sought by

more than one method in any given case. The chief reliance is to be placed on the keratometer (ophthalmometer), skiascopy, and the test-lenses.

The keratometer measures only the corneal astigmatism, which commonly predominates and approximately corresponds to the total astigmatism. Its value is mainly that it makes an important suggestion as to the presence, degree, and direction of the astigmatism, which, when followed up by other methods of measurement, effects a saving of time. Skiascopy measures the total astigmatism of the eye, usually with the greatest accuracy of any method. Committee on Objective Tests for Ametropia (Trans., Section on Oph., Amer. Med. Assoc., '94).

Latent astigmatism may, in many cases, be made manifest and measured without a cycloplegic, by giving lenses, which correct the manifest only, to be worn a day or two, when additional astigmatism will be manifest, which is also to be corrected; and so on, until the latent trouble is unmasked. H. M. Starkey (Trans. Sec. on Oph., Amer. Med. Assoc., '95).

In determining astigmatism make the meridian of least refraction slightly myopic, and determine the astigmatism by concave cylindrical glasses, afterward ascertaining the spherical glasses. In other words, make the astigmatism myopic, and then measure it in the remote zone, generally by distance tests. George J. Bull (Oph. Review, p. 275, '95).

Whether astigmatism is even partially corrected by unequal contraction of different parts of the ciliary muscle, or is not so corrected, must still be regarded as uncertain.

In two medical students with normal vision the vision remained good with strong cylinders, but after the use of atropine no cylindrical lens whatever could be overcome. To prevent error the eyelids were held so that they could not press on the globe. From this experiment it is inferred that the power of accommodation enables the eye to overcome astigmatism either by change in the curvature of the crystalline lens or by tilting it. Guilloz (Arch. d'Oph., vol. xiii, p. 676).

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When the retinal lies half-way between the anterior and posterior focal lines, it receives small circles of diffusion, which allow lines running in different directions to be seen with equal clearness. Placing before one eye fine print, and before the other cross-threads, when the fine print was read the threads were only seen clearly if accurately placed at the point for which the eyes were focused. When reading with eyes made astigmatic, it was found that the astigmatism was corrected by bringing these smaller circles of diffusion on the retina. By extremely fine threads placed to correspond with the meridians of astigmatism it was demonstrated that under the most favorable circumstances no compensatory action in the ciliary muscle was shown. C. Hess (von Gräfe's Archiv, Part II, '96).

Treatment. — For regular astigmatism the usual remedy is the wearing of cylindrical lenses, which should correct the full amount of the astigmatism and be worn constantly. Any case of astigmatism may be thus corrected by a convex cylindrical lens with its axis placed parallel to the meridian of greatest curvature, or by a concave cylindrical lens with its axis placed perpendicular to this, or by two lenses of proper strengths with their axes respectively parallel to the two meridians. As may readily be demonstrated mathematically or by trial, the optical effect of any possible combination of cylindrical lenses may be produced by the proper single cylindrical lens combined with the proper spherical lens.

Literature of '96-'97-'98.

Javal has pointed out that sometimes the meridians of greatest curvature are not perpendicular to each other. Two cases are reported, corrected by crossed cylinders with their bases obliquely

placed parallel to these oblique meridians. Roure (Arch. d'Oph., Apr., '96).

The fact that corneal incisions change the corneal curvature has suggested their employment for the correction of astigmatism.

The effect of the incision is greater the nearer it is placed to the centre of the cornea. The incision may be made at right angles to the most convex meridian. The amount of correction is to be regulated by their number, depth, and location. The operation performed tentatively gave no effect on the astigmatism of one, and raised the vision without glasses in the other. W. H. Bates (Arch. of Oph., p. 79, '94).

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Myopic astigmatism may be corrected by removal of substance at its periphery, without perforation of the cornea, with the galvanocautery, or with a special knife or gouge. This gives flattening of the cornea perpendicular to the direction of the loss of substance. M. Pflueger (Ann. d'Oecul., p. 640, '96).

Ten observations show the possible diminution and relative curability of astigmatism by incisions in the cornea. The change from one incision was about 1 dioptre. When the incision is not carried through the cornea so as to permit the escape of the aqueous humor, contrary to what takes place after cataract extraction, iridectomy, etc., there is an increase of the corneal curvature in the direction of the incision. Lucciola (Arch. d'Oph., Oct., '96).

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ATHETOSIS. — (Lat.). From Gr., ἄθετος : α, priv., and τιθέναι, to bring into position.

Definition.—A nervous disorder characterized by involuntary movements of the fingers and toes, apparently of a uniform and systematic character. It may be partial, affecting a limited portion of the body, or general, the movements being wide-spread. The latter form is also termed "idiopathic."

Symptoms.—The striking peculiarity of this disease, first described by W. A. Hammond, of New York, is that the parts concerned in the spasmodic movements, usually the fingers and toes of the one side, are constantly moving, though to a limited degree, during sleep, independently of the patient's will. The fingers are alternately flexed and extended with varying degrees of adduction and abduction, and with a tendency to distortion. The movements are not always limited to the fingers and toes, however, the muscles of the arm and leg, and sometimes those of the face, taking part in the spasmodic seizures in a small proportion of cases. In these cases the arm is swung to and fro in regular rhythmic movements and the alternate contractions and relaxations of the faciai muscles give rise to grimaces. These movements are often preceded, or accompanied, by other symptoms of cerebral disease, especially epileptic seizures and impairment of the intellect. This occurs most frequently in middle-aged men of intemperate habits. Hemianæsthesia and other perversions of sensation are often present.

Case of spastic hemiathetosis in a man, 20 years of age, who, in his fourth year, had had a sudden attack of right hemiplegia. There were athetoid movements in the upper and lower extremities on the right side; corresponding reflexes increased. Pressure along the nerve-trunks of the right extremities brought on a permanent contraction, which lasted as long as the pressure was kept up, resembling very much a cataleptic condition. Alex. Koranyi (Jour. of Nerv. and Mental Dis., Sept., '92).

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Rare motor affection of the pupil described under name of pupillary atheto-

sis. The patient was subject of enormous divergent strabismus of left eye, with well-marked ptosis. Eye was fixed for upward, inward, and downward movements consequent on a paralysis of the superior rectus, of lesser oblique, of the internal, and inferior recti. On examining condition intra-ocular muscles following abnormal reactions were observed: Looking at left pupil in full light it appeared to be the same size as the right, but on trying reflex to light after several seconds of closure of the lid, on opening the eye the pupil dilated instead of contracted to the stimulus of light. Having reached its maximum dilatation, it remained dilated for some three or four seconds, then a gradual contraction of the sphincter occurred, lasting some eight or ten seconds longer. Soon, however, the sphincter gradually gave way, and the pupil regained its original condition of dilatation. This mydriasis lasted for about thirty seconds, and after a pause of a few seconds more the phenomena just described reappeared rhythmically. To this cycle of contraction and dilatation name of pupillary athetosis given. Fromaget (Annales de la Policlinique, July, '98).

The idiopathic form is usually bilateral; the gait is characteristic in the majority of cases; they seem constantly to be on the point of falling, while violent contortions of the extremities occur simultaneously.

Case in which, at every attempt at motion, hand, fingers, legs, and feet slowly flexed. R. M. Phelps (Inter. Med. Mag., Feb., '95).

Etiology.—The etiology of this affection is obscure. Falls, compression of the head during birth, cerebral hæmorrhage, fright, alcoholism, syphilis, and cerebral growths are among the most prominent factors. Heredity has been clearly ascertained in a number of cases.

Case of athetosis affecting principally the left hand of a woman aged 43 years. The disease commenced in childhood, after a fall, which caused no other disturbance. Von Bonsdorff (Finska Läkaresällskapets Handlingar, B. 30, H. 3).

Case of acute hemiparesis with hemiathetotic movements, following excessive use of the arms for two days and two nights in a handicraft. Lowenthal (Deutsche med. Woch., Apr. 11, '89).

Double athetosis following birth or occurring in early infancy belongs to the group of infantile cerebral diplegias. The common feature of these affections is premature birth or difficult labor, and the common lesion is arrested development of the pyramid. Lannois (Le Bull. Méd., Apr. 19, '93).

Typical athetotic movements after sudden fright in a child. Rauzier and Cazalis (Le Bull. Méd., Nov. 28, '94).

Double athetosis in a syphilitic woman. Father epileptic. Brandeis (Le Bull. Méd., Sept. 1, '95).

Cases in mother and child. Symptoms exactly alike. Oppenheim (Berliner klin. Woch., Aug. 26, '95).

Three cases of hemiathetosis in a young child, and of double athetosis in a woman and a young boy. Archibald Church (Rev. of Insan. and Nerv. Dis., Mar., '92).

Case of generalized athetosis in a child of 4 years, the cause of which appeared to be a cerebellar tumor. Hugh Hagan (N. Y. Med. Jour., Jan. 16, '92).

Case of bilateral athetosis in a man of 43 years, formerly insane and addicted to alcohol, in whom the disease developed gradually, beginning at the extremities, and later on involving the neck, the face, and finally accompanied by complete aphasia. Parsons Norbury (Med. Fortnightly, Apr. 15, '92).

[This case is interesting, as it shows that double athetosis is not always accompanied by imbecility, and that it does not always date from early infancy. Bourneville and Sollier, Assoc. Eds., Annual, '93.]

Case of athetosis which, like so many cases of the kind, developed after an apoplectic attack when the patient was a child (3 years old), and had persisted now for twenty-three years. The movements do not stop altogether during

sleep. Report of PROFESSOR BAELZ (Corres. Ed. of the Annual, Tokio, Japan).

Case of hemiathetosis in a young child, following measles, supporting the personal opinion, given in 1887, that the disease originates in children in infectious diseases, either of unknown or of well-known origin, such as the eruptive fevers of infancy. Roberto Massalongo (Riforma Med., Sept. 3, '92).

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Case of functional athetosis, apparently of traumatic origin. The patient—a girl, aged 9 years, with a negative family history—had fallen from the rings while exercising in a turning-school, but apparently suffered no bad effects from the fall. Inattention, carelessness, and lack of desire for study first appeared, followed by great difficulty in holding any object in her left hand. There were also certain peculiar, involuntary movements of the left upper extremity, more marked in the hand and fingers, which were always brought on by attempts at voluntary movements, and which were never present during sleep. Left foot dragged slightly when walking. Pupillary and patellar reflexes were normal; no impairment of sensation; no contraction or atrophies; muscular power in left hand and arm did not seem impaired, though there may possibly have been a slight degree of paresis, and muscular development was normal. Heart-sounds were normal. Examination of eyes negative. Iron and arsenic administered. In five weeks the athetoid movements had disappeared. E. G. Thomas (Medicine, Aug., '97).

Pathology.—Athetosis is closely allied to posthemiplegic chorea, and is usually due to some lesion of the optic thalamus, —a thrombus or tumor and particularly to embolism.

Case of athetosis, or choreic spasm of the right side of the body, due to a tumor of the left optic thalamus and adjacent internal capsule. All the cases of athetosis and chorea following hemiplegia are due to lesions in this vicinity. Seguin (Boston Med. and Surg. Jour., July 17, '90).

Autopsy of case upon which W. A. Hammond's description of the disorder was based. The portion involved in the lesion had consisted of fibrous connective tissue. Topographically, the lesion was a lengthy one in the antero-posterior direction, parallel in its short axis with the internal capsule. Its posterior end had invaded the stratum zonale of the thalamus on its posterior third and the posterior half of the internal capsule. In its anterior extension it had crossed the capsule, invading the posterior third of the outer lenticulus. The author called attention to the fact that this case was further evidence of his theory that athetosis was caused by irritation of the thalamus, the striatum, or the cortex, and not by a lesion of the motor tract. G. M. Hammond (Boston Med. and Surg. Jour., July 17, '90).

Lesions of the lenticular nucleus have also been found, consisting mainly in softening.

Case, in a young girl of 12 years, dating from birth, of double athetosis, with autopsy. An absence of the corpus callosum and of the floor of third ventricle was observed. The left temporal lobe was retracted, and the lenticular nucleus softened and completely bare. At the extremity of the lobe there was an old abscess; capacity about one ounce. In the right temporal lobe there was also a small cavity, the seat of a former abscess. Athetosis is a pathological entity. Lesion of the lenticular nucleus is met with in the majority of cases. J. Wright Putnam (Jour. of Nerv. and Mental Dis., Feb., '92).

Case of athetosis, following a left-sided hemiplegia, in which the autopsy revealed four or five points of softening of the size of the head of a pin in the right nucleus lenticularis, and an old hæmorrhage the size of a hazel-nut lying between the body of the nucleus caudatus and the optic thalamus, and involving the knee of the internal capsule

of the right side. Sabrazès (Jour. de Méd. de Bordeaux, Oct. 6, '89).

Case proving that athetosis is not due to irritation of the lenticular nucleus, but of the neighboring pyramid. It also confirms the opinion of Schiff that the striated body exercises no motor function. Combe (Revue Méd. de la Suisse Rom., Oct., '92).

The motor regions of the cortex are thought, by some observers, to at least be implicated in the pathological process.

The lesion of athetosis is undoubtedly in the cortex of the brain, and the best success may be obtained from galvanism there and also to the head. Rienzi (Gaz. degli Osp., '86).

Four cases of hemiathetosis in which the movements ceased during profound sleep, but persisted to a moderate degree during light sleep, tending to indicate that the point of origin of the movements of athetosis lies in motor regions of the cerebral cortex, although many autopsies have shown a lesion of the anterior portion of the internal capsule in such cases. Eulenberg (Wiener med. Presse, Feb. 24, '89).

There may be a lesion of the cerebral convolutions, with descending degeneration; so that double athetosis may be regarded as a cerebro-spinal affection. The abnormal movements are caused by an irritation of any portion of the motor tract. Massalongo (Le Progrès Méd., Jan. 18, Oct. 11, '90).

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In fourteen cases of athetosis in which autopsies have been made, foci were found seven times in the striatum, four times in the thalamus, twice in the pons, and once in both thalamus and striatum. In three other cases only cortical lesions were reported, but the possibility of involvement of the basal ganglia has not been excluded in these. In two reported cases of paretic dementia with athetosis the lesions were limited to the cortex, personal case in which there was intense atrophy of the thalamus, attributed mainly to the involuntary movements. The cortical lesions did not differ from those seen in many cases of general paralysis without athetoid movements. The degeneration of the pyramidal tract was equally intense above the motor decussation. M. Sander (Neurol. Centralb., No. 7, '97).

Diagnosis.—There is no absolute difference between athetosis and posthemiplegic chorea. If the lesion be acute, hemichorea is produced; if chronic, hemiathetosis. In chorea the movements are sudden and involuntary; in athetosis they are slow, and ordinarily do not interfere with voluntary acts, except to lessen their rapidity. (Rienzi.)

Study of muscular shocks and the faradic electrical reactions in a patient attacked with complete left hemiathetosis, the face being included. The muscular tonus was exaggerated by the galvanic current. The form of athetotic contraction greatly resembles that of contracture, whence its greater importance than in choreiform movements. There is inequality in the muscular tonus, shown by faradic reaction, which arises, doubtless, from the irregular, spontaneous contractions of the muscles. Domenico Cappozzi (Riforma Med., Aug. 25, '92).

Treatment.—Although this disease is regarded as incurable, functional cases have been reported in which arsenic and iron, with bromide of potassium, have brought about satisfactory results. The galvanic current, the positive pole being placed over the brachial plexus and the negative on the neck, has been recommended by Krafft-Ebing. Hammond has obtained good results from nerve-stretching.

Case treated at first with potassium bromide, afterward with arsenic, and blisters were applied behind the right ear. The movements gradually ceased. The patient was quite well in three weeks and had no relapse. Macaldowie (Brain, July, '88).

Treatment lasting six weeks, and consisting of 1½ drachms of bromide of potassium daily, and the stabile application of the galvanic current of 2 milliampères, the positive pole on the brachial plexus, the negative on the neck, brought about a temporary cure, which would probably have been permanent had the treatment been continued longer. Krafft-Ebing (Wiener klin. Woch., Apr. 18, '89).

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Marked case in which three months' rest in the hospital, electrical treatment, and the administration of codliver-oil, arsenic, and iron improved affected muscles very much. Strychnine was found to increase the rigidity. Since leaving the hospital, however, the paralysis and the wasting have made steady progress. Michell Clarke (Bristol Medico-Chir. Jour., June, '97).

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ATROPINE.—Atropine (atropina of the U. S. Ph. and Br. Ph.; atropinum of German Ph.) is an alkaloid obtained from the leaves and roots (bark of the root) of the deadly-nightshade (*Atropa belladonna*, L.). It occurs in white, acicular crystals, or in white, amorphous powder (turns yellow upon exposure to the air) of bitter, acrid taste and decided alkaline reaction; is soluble in 130 parts of water, 3 parts of alcohol, 16 parts of ether, 4 parts of chloroform, and in 50 parts of glycerin. It melts at 239° F. Atropine forms salts, when combined with acids, among which are the hydrochlorate, nitrate, salicylate, and sulphate; these salts are generally used on account of their greater solubility and neutral reaction.

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Atropine and hyoscyamine are practically identical, and both atropine—heavy atropine—and hyoscyamine—light atropine—can be obtained from either belladonna or hyoscyamus. The tendency, nowadays, is to use the term "heavy" atropine in place of atropine, and "light" atropine in place of hyoscyamine. The difference between them is purely chemical, and pharmacologically the two products are identical.

These discoveries necessitate a considerable modification in the classification of the alkaloids originally adopted. The most recent views on the subject are expressed in the following table:—

Belladonna contains.....Atropine.
Hyoscyamus contains { Hyoscyamine=.....Atropine.
Hyoscine { Scopolamine.....Scopolamine.
Hyoscyamine=.....Atropine.
Stramonium contains { Atropine.....Atropine.
Daturine { Hyoscyamine=.....Atropine.
Scopolia contains.....Scopolamine.
Duboisia contains Duboisine=Hyoscyamine=.....Atropine.

This arrangement considerably lightens our labors, for, instead of having half a dozen alkaloids to consider, we have now only two. William Murrell, of London (Med. Brief, Jan., '98).

Atropine is chemically incompatible with the alkalies, tannin, and the salts of mercury; it is physiologically incompatible with morphine (opium), pilocarpine, muscarine, aconitine, and eserine (physostigmine).

Dose and Physiological Action.—The usual dose of atropine given internally is from $^1/_{120}$ to $^1/_{60}$ grain. The maximum single dose is $^1/_{20}$ grain. The physiological action has been observed and described by John Harley. If $^1/_{120}$ grain be injected beneath the skin of a healthy adult, there will be noticed, after 10 to 20 minutes, a quickening of the pulse, and generally a small increase in volume and power. This change will be very decided if the pulse was previously slow and feeble. The increase in the number of pulse-beats will generally amount to 20 per minute; it will take place suddenly, and attain its maximum within one or two minutes. In about half an hour a gradual decline takes place and the heart soon returns to its usual state, and continues to beat

as quickly and powerfully as before. Just as the pulse rises, a slight giddiness is often perceptible. Usually these will be the whole of the symptoms; but, in weak and delicate adults, a feeling of dryness of the mouth and throat, and, at the end of an hour or two, a slight dilatation of the pupil, in a subdued light, will be superadded.

When $^1/_{60}$ grain is used, the acceleration of the pulse will be found to range between 20 and 60 beats, the rise being attended by considerable giddiness and waviness of the vision. The patient walks cautiously, and with an inclination to unsteadiness. After 20 to 40 minutes he will complain, with some huskiness of voice, of great dryness of the throat and mouth; and the anterior part of the tongue or the whole of the dorsum, excepting a wide margin, will be found dry, brown, and rough. The hard palate and, in many persons, the soft palate also, will be perfectly dry and glazed. There will be more or less somnolency, and sometimes a little flushing of the face. The dilatation of the pupils will amount to $^1/_7$ or $^1/_6$ inch.

The effects of $^1/_{48}$ grain (a full medicinal dose) are as follow: After 10 or 15 minutes an acceleration of the pulse from 20 to 70 beats; no apparent change in volume, but a decided increase in the force of the cardiac contractions and of the arterial tonus; a general diffusion of warmth, a slight throbbing or heaving sensation in the carotids, and a feeling of pressure under the parietal bones; giddiness, heaviness, drowsiness, or actual sleep, with great tendency to dreamy delirium, and, in women, slight occasional startings; complete dryness of the tongue, roof of the mouth, and soft palate, extending more or less down the pharynx and larynx, rendering the voice husky, and often inducing dry cough and difficulty in swallowing; parched lips, occasional dryness of the mucous membranes of the nose and eyes, and increasing dilatation of the pupils. After about two hours the dryness of the mouth is relieved by the appearance of a viscid, acid secretion of an offensive odor, like the sweat of the feet; the mouth becomes foul and clammy, and a bitter, coppery taste is complained of; but as moisture returns to the mouth, the pulse is observed to fall, and it now rapidly regains its ordinary rate and character. The pupils have now reached their maximum dilatation and measure, —about $^1/_5$ inch; but, when exposed to bright light, they will still contract to $^1/_4$, $^1/_6$, or even $^1/_8$ inch, according to their original size. Slight elevation of surface-temperature is noticed during the action of the medicine, rarely exceeding 1°, and a still less elevation of the internal temperature of the body. No difference will be observed in the rate of the respiration, except (in nervous women) a little emotional excitement on the sudden accession of the giddiness. The breathing will be tranquil, the patient occasionally heaving a deep sigh, and still oftener taking a prolonged yawn, as he sits still in a dull, apathetic or drowsy condition. After the pulse has resumed its ordinary rate, and the mouth has become moist, the giddiness and drowsiness pass off, and the patient appears tolerably lively and brisk in mind and body. But he will himself continue to feel for some hours longer such languor of body and mind as will render him disinclined for, or even incapable of, active bodily or mental exertion. Slight dimness of vision also remains, and the patient is unable to thread a needle, or even to read.

If larger doses be given, there will be superadded a distressing fluttering sen-

sation in the cardiac region, slight delirium; exquisite sensibility of hearing, and frequent illusions of this sense also; staggering, or complete inability to walk; insomnia, restlessness, and frequently great nervous agitation of mind and body. Nausea and headache are rare and exceptional consequences of the subcutaneous use of atropine, but sometimes follow when given by the stomach in full doses.

Certain conditions modify the action of atropine. Children are more tolerant of the drug than adults, and in this respect resemble the lower animals; and while acceleration of the pulse, dilatation of the pupils, and dryness of the mouth are more readily induced in them, cerebro-spinal effects—giddiness, drowsiness, sensory illusions, and unsteadiness of gait—are only developed after a very large dose. Pregnancy appears to diminish the activity of atropine. The weak, and those of excitable temperament, are more readily and powerfully influenced than the strong. In renal disease, when the secretion of urine is diminished, or only moderate in quantity, the effects of atropine are readily induced and considerably prolonged; in persons with unusually active kidneys, the action of the drug is less pronounced. While atropine in contact with caustic soda and potash is decomposed in the course of two or three hours, these bodies have no power of annulling or even diminishing the action of the alkaloid within the body. Acids have no particular influence on the action of atropine. When administered by the stomach, the action of the drug is sometimes prolonged for two hours, and then develops suddenly.

Atropine passes undiminished and unchanged through the blood, and the kidneys are active in its elimination from the minute that it enters the circulation until it is entirely removed from the body. After a full medicinal dose, between two or three hours are required for this purpose. The presence of atropine in the renal secretion after taking the drug may be demonstrated by dropping one or two drops of the urine within the eyelids of another person or animal at intervals of 10 to 20 minutes for two or three hours and noticing its dilating action on the pupils. The atropine may be separated from the urine by shaking the latter with a quantity of chloroform equal to a sixth of its bulk, and separating the chloroform, or allowing it to evaporate spontaneously. The remaining stain is dissolved in a few drops of water, and a drop placed within the eyelids. The $^1/_{96}$ grain of atropine sulphate (sufficient to kill an infant) may thus be easily detected in the urine.

Atropine is a true diuretic and more powerful than any other that we possess, though in medicinal doses the diuretic effect is often masked by retention of urine. There is, after taking atropine, an increased elimination of all the solids (excepting generally the chlorine); the urea is always increased, often to a considerable extent, and, most of all, the phosphates and sulphates, which are sometimes doubled.

> Sulphate of atropine was injected into the external jugular veins of rabbits first narcotized by chloral-hydrate, and the urine flowing from a cannula in the bladder measured every five minutes, registering the blood-pressure at the same time. The dose of the atropine salt used ($^1/_{12}$ grain) was large, but this quantity is well tolerated by rabbits; sometimes the dose was frequently repeated, and sometimes a still larger one was employed. In all but one the atropine was injected after I had raised the secretion of urine by the intravenous injection of urea, caffeine sulphonic acid,

or theobromine sodium salicylate. The results of the experiments show that a diminution of the flow of urine usually follows the intravenous injection of atropine, independently of the blood-pressure, which is often raised. A series of experiments made with different strengths and quantities of urea solutions seem to show that the kidneys are not injured even when large quantities of urea are injected. Albumin was only occasionally met with after the injection of urea, and then in mere traces, though small quantities of sugar were found when an increased urinary flow had been produced by large quantities of urea. Walti (Archiv f. exper. Path. und Phar., B. 36, H. 5, 6, '95).

Atropine diminishes the quantity of urine; it diminishes the total quantity and percentage quantity of urea; it increases relatively, and in many cases absolutely, the amount of nitrogen, other than that contained in urea. These effects cannot be attributed to the influence which the alkaloid exercises upon blood-pressure. How atropine acts to produce an elevation of the bodily temperature has not been definitely determined. Thompson (Jour. of Phys., Dec., '93).

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Atropine decreases the amount of urine, apparently by virtue of a paralyzing action on the terminations of the vagus. Lazaro and Pitini (Archivo di Farm. e Ter., v; Deutsche med.-Zeit., Feb. 3, '98).

The action of atropine on the sympathetic nervous system and the circulation is that of a direct and powerful stimulant. During the operation of medicinal doses the heart contracts with increasing vigor, the arteries increase in tone and volume, the capillary system is also stimulated, and a diffused warmth is felt throughout the body. If the dose be excessive, overstimulation is produced and signs of exhaustion are soon manifest. The maximum stimulant effect follows the use of moderate doses only, generally $^1/_{96}$ grain, not more than $^1/_{48}$ grain.

Several experiments made prove that the rise of temperature is not spinal, as heretofore held by me. The results obtained with the ingestion of atropine, after various operations, such as section in front of the pons Varolii and of the medulla oblongata, were so similar to those obtained after the same operations without atropine that I find it difficult to speak accurately as to the cerebral centre affected. The slight rise of temperature observed in the rabbit after puncturing the medulla oblongata or pons Varolii has not led me to believe in the existence, in these bodies, of thermogenic centres. I therefore conclude that, until the existence of heat-centres in the medulla and pons has been accurately determined, it is useless to assume that atropine acts upon them. Ott (Jour. of Nerv. and Mental Dis., Nov., '93).

The skin becomes the seat of a sensation of warmth followed by a temporary blush, and in children and adults of light complexion is sometimes followed by a scarlet suffusion, described by some as a "scarlatinous rash." In persons subject to vascular irritation of the skin the redness remains and its disappearance may be attended with slight roughness and desquamation. Harley states that the general effect of atropine on the circulation predisposes to sweating; but Ringer, Bartholow, and others ascribe to atropine a strong inhibitory action over the sweat-glands. Certain it is, however, that atropine inhibits the secretory function of the mammary and salivary glands.

As regards the function of the liver, Harley believes atropine to be a cholagogue. By the action of atropine upon the unstriped muscular fibres, intestinal peristalsis is intensified.

While acting as a depressant to the hepatic function, atropine causes no

change in the amount of iron in the liver, and only a slight diminution in the quantity of glycogen. Brunton and Delépine (Proceedings of the Royal Society, No. 234, '94).

Atropine, in doses of $^3/_4$ grain, is able to instantly kill the leucocytes contained in $3\,^1/_3$ ounces of human blood, and in quantities of $^1/_3$ grain the leucocytes contained in $3\,^1/_3$ ounces of human blood live but a few hours. On the other hand, the leucocytes contained in $3\,^1/_3$ ounces of blood of the rabbit were not affected by a dose of $^1/_3$ grain of atropine. Maurel (Bull. Gén. de Thér., Apr. 15, '92).

Atropine, like quinine, in daily doses of $^1/_{64}$ grain produces a lessening in the number of leucocytes in the blood and in the amount of uric acid eliminated by the kidneys. Horbaczewski (Revue de Thér. Gén. et Thermal, Sept. 20, '92; Thèse de Bordeaux, T. C., Dec. 3, '92).

Experiments made upon two persons suffering from gastric catarrh and two others who were in a state of health showing that atropine distinctly lessens the secretion of the gastric juice. When medicinal doses were used in healthy persons the decrease was very marked, while in those who had gastric catarrh no changes were noted. Panow (Wratsch, No. 7, '90).

Dilatation of the pupil is a prominent effect of atropine, however introduced into the system, accompanied by temporary paralysis of the muscle of accommodation.

In its action on the cerebro-spinal system the general effects of atropine resemble those of opium in that it is both an excitant and hypnotic, but the soporific effect is less marked; and coma, if it occurs, must be considered a remote consequence rather than a direct effect of the action of the drug. After large doses insomnia and delirium arise and poisonous doses prolong these effects for hours, and coma gradually supervenes. Headache, vertigo, illusions, hallucinations, a busy delirium, and sometimes somnolence are produced by large doses. More or less anæsthesia of the sensory centres of the cerebrum. The action on the motor centres and the spinal cord is comparatively slight. The corpora striata participate both in the hypnotic and in the excitant effects. Giddiness and muscular weakness, from inability for exertion, accompany the hypnotic effect, while restlessness and insomnia occur when the hypnosis is overruled by the excitant action. The spinal cord is least of all affected by atropine.

Atropine Poisoning.—Fatalities from atropine are comparatively rare, for the lethal effect comes on very slowly, and generally gives time both for appropriate treatment and for its elimination through the natural channels. One-half grain of atropine has proved fatal, though Harley reports recovery after the ingestion of $1\,^1/_2$ grains.

The symptoms of poisoning are, in general, those following the use of a large dose (previously described), but more intensified. The action of the heart, however, while increased in frequency, is diminished in force; the arterial tension becomes subnormal; the pulse weak and its rhythm disturbed. As the vascular pressure falls, the skin cools, its color fades, and it becomes covered with clammy sweat. The delirium, at first mild and happy, becomes unpleasant or disagreeable, or may take the character of the delirium of terror, resembling the maniacal type. The respiration becomes feeble, superficial, rapid, and irregular. Disturbance of the respiratory functions and the impaired action of the heart and blood-vessels cause passive congestion of the lungs and brain. The urine, previously increased in amount, is diminished or even suppressed from lessened vascular press-

ure. Post-mortem examination reveals a distension of the right heart and congestion of the brain, lungs, and abdominal viscera.

Case in which 20 grains of atropine were taken. The patient died three hours later, despite all aid. Editorial (Med. Press and Circular, Mar. 13, '89).

Case in which the instillation of two drops of a solution of atropine sulphate ($^1/_{90}$ grain of salt) in the eyes of a girl 10 years of age was followed in the course of ten minutes by the usual symptoms of poisoning, which, however, subsided after five hours. Sangree (Times and Register, June 28, '90).

Girl, aged 10 years, suffered from quite severe symptoms of poisoning from use of atropine drops, used three times a day during two weeks in left eye for attack of keratitis. Kelynack (Brit. Med. Jour., Feb. 22, '90).

Case in which a drop of atropine solution introduced into the eye, to correct astigmatism, produced an erysipelatous inflammation of the eyelids and face. Wallace (Univ. Med. Mag., Jan., '92).

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Case in which 5 minims of official solution of atropine, B. P. (4 grains to 1 ounce), was injected for relief of pain. In a quarter of an hour dryness of throat, giddiness, intoxication, and distress; in half an hour delirious. After two and one-half hours insensible and restless; noisy, pleasing delirium of Murrell present. After three hours $^1/_6$ grain of pilocarpine injected subcutaneously and repeated in half an hour without effect. Two hours later more pilocarpine, which produced no physiological effect, but the delirium was lessened. Six hours after receiving atropine patient became suddenly conscious under use of mustard sinapisms to calves of legs and enema of rum, strong ammonia, and very hot coffee; now urinated freely. Completely recovered, except being a little shaky; one and one-half hours later said something had happened to him, but what that something was had gone. Duke (Lancet, June 27, '96).

Case of man who injected hypodermically, in place of morphine, $^3/_{25}$ grain of atropine. Recovery under hypodermics of whisky, strychnine, and pilocarpine after fifteen hours. He was accustomed to heavy doses of morphine, and sometimes added a little atropine; hence it was not deemed advisable to employ the opium alkaloid in treatment. McIntyre (Medical Age, Mar. 10, '96).

Case of a girl, aged 11 years, who complained of a constant, watery, nasal discharge. She went to an eye clinic on account of impairment of vision and a number of drops of atropine solution were instilled into both eyes. On the evening of the same day emesis occurred, without nausea. The following day she complained of postnasal dicharge of a watery fluid, accompanied by a free anterior discharge, in which were masses of thick mucus. Previous to the use of the drops there had been no signs of nasal trouble. The turbinals were pale in color with sodden appearance, as in hay fever, and soft and "boggy" to touch, as if relaxed.

Treatment of the rhinitis consisted in cleansing the nasal chambers with a mild, antiseptic, alkaline solution: menthol (2 grains to the ounce) and an ointment of 2 grains of yellow oxide of mercury to the ounce of lanolin. Recovery ensued in a few days. This case was undoubtedly due to an idiosyncrasy to atropine. L. S. Somers (Laryngoscope, Oct., '97).

More deaths have followed medicinal doses of atropine than of any other drug; if possible, therefore, other drugs should be substituted for it. Atropine has been used in the following diseases: 1. Neuralgia and other painful affections. Considering the large number of analgesics available, it should be used in the present day in exceptional cases only,—for example, in angina pectoris. 2. Whooping-cough and asthma. If the cases are severe and have resisted all other treatment, atropine may be tried. 3. The same applies to epilepsy. 4. It is very doubtful whether it is of any use in hysteria, paralysis agitans, and other tremors. 5. Chronic constipation. As there are plenty of substitutes, its use should be discontinued. 6. Lead

colic. In this disorder the subcutaneous use of atropine has more disadvantages than advantages. 7. Nocturnal enuresis. Great caution is necessary, since large doses are required as a rule. 8. As a cardiac tonic, and in those cases of permanent bradycardia which often end in epilepsy, atropine has been tried without much success in the latter cases, possibly because a slow pulse does not always correspond to a slowly acting heart. According to Dehio, it may benefit slight cases of cardiac irregularity, but is without effect in severe ones. 9. In night-sweats it acts well; but, although small doses tend to prevent collapse,—which is common in phthisical patients,—larger ones increase the liability to it. To begin with a dose of $^{3}/_{200}$ grain is unjustifiable in advanced cases of phthisis. 10. In chronic hypersecretion of HCl by the gastric mucosa several observers have found that atropine diminished the secretion, but others deny this. However, considering the bad effects of this hypersecretion on the gastric mucosa, in the present state of our knowledge atropine must still be tried. 11. Some observers state that atropine, given hypodermically, arrests hæmorrhage (hæmoptysis, etc.) by its action on the arterioles. 12. The injection of atropine before the administration of chloroform to prevent syncope has been given up by surgeons. 13. It has been recommended as an antidote to barium salts, hydrocyanic acid, nicotine, pilocarpine, and muscarine poisoning. 14. The question of its use as an antidote to opium will be studied in a further communication. Lépine (Sem. Méd., Nov. 25, '96; Brit. Med. Jour., Jan. 9, '97).

Case of physician who desired to give patient an hypodermic injection of $^{1}/_{60}$ grain of atropine. He weighed out a grain of atropine and, placing this in a graduate, dissolved it in a drachm of water. Of this solution he took one minim, leaving the remainder of the atropine in the graduate. A little later in the evening he felt thirsty, and he took the graduate containing the atropine, and, filling it with water, drank it down. In a little while he began to feel the characteristic effects of the drug. He immediately recognized the cause and injected a full grain of morphine sulphate hypodermically. After a period of misery and suspense, the poisonous symptoms subsided and he recovered. Editorial (Harper Hosp. Bull., May, '98).

A case of lobster-poisoning simulating poisoning with atropine in one man and two women. Evacuation was induced only after large doses of castor-oil, senna, magnesium sulphate, and several soap-enemata. The general toxic symptoms improved under the hypodermic administration of pilocarpine ($^{1}/_{7}$ grain), while for the eye symptoms it was found necessary to employ eserine, 1 to 2 drops of a 5-per-cent. solution twice daily. Fischer (Nouv. Rem., Apr. 8, '98).

Treatment of Atropine Poisoning.— If seen early enough, emetics or warm drinks should be administered, followed by the use of the stomach-tube. Tannin and charcoal may be used if a stomach-tube is not at hand and absorption has not taken place. Among the antidotes advised are coffee, alcohol, pilocarpine ($^{1}/_{8}$ to $^{1}/_{4}$ grain), muscarine nitrate ($^{1}/_{30}$ to $^{1}/_{15}$ grain), morphine sulphate ($^{1}/_{8}$ to $^{1}/_{2}$ grain), or eserine ($^{1}/_{200}$ to $^{1}/_{60}$ grain). The violent action of the drug should be restrained by the use of the foregoing antidotes given by hypodermic injection, in moderate doses, and repeated at intervals, as indicated by the condition of the patient and the urgency of the symptoms.

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Case illustrating the paralyzing influence of atropine, but also demonstrating that persistent effort is frequently rewarded by recovery in the most serious cases. Begold (Wratch, No. 4, p. 96, '96).

Therapeutics. — Disorders of the Eye.—Atropine is greatly employed in ophthalmological work, not only as a

therapeutic agent, but largely in diagnosis, as it dilates the pupil, diminishes intra-ocular pressure, contracts the arterioles, and acts topically on the sentient nerves. Atropine is used when we wish to suspend the power of accommodation in cases of myopia or hypermetropia to determine the exact error of refraction, and in astigmatism to ascertain the difference in the meridians. In the examination of cataract (especially in its early stages) the use of atropine is of great value. A wider and better view of the fundus of the eye is also obtained through the pupil dilated by atropine. As a therapeutic means, atropine is invaluable in all superficial inflammatory conditions of the eye in which pain, tenderness, and photophobia are present. Mild solutions (1 or 2 grains to 1 ounce) instilled within the eyelids generally give prompt relief. In strumous corneal ulcers and phlyctenular keratitis (by diminishing photophobia and blepharospasm and lessening blood-supply) a few drops of a mild solution (1 grain to 1 ounce) two or three times daily will give relief. In syphilitic iritis where posterior or anterior synechiæ are a frequent complication, early and constant dilatation of the pupil should be secured through the use of solutions of atropine (2 to 4 grains to 1 ounce). Atropine will relieve the photophobia of acute conjunctivitis and also that of chronic conjunctivitis associated with blepharitis and granular lids, if used in mild solution and not too frequently applied.

In penetrating wounds of ciliary region and lens, even where light-perception is gone and where usually enucleation is performed, removal of lens will often be followed by recovery of comparatively useful vision; operation to be performed during first week of injury. Irritating solutions to be avoided. After-treatment: atropine, 1 per cent., every four hours, and compress bandage. Randolph (N. Y. Med. Jour., Feb. 23, '95).

As a general rule, the treatment of axial myopia without glasses will improve the vision to that previously obtained with glasses. I use atropine, with local bathing with hot water, and leeches to the temple. Dark glasses are worn to protect the eyes from light, and astringents are applied to the conjunctiva. Bates (Med. Record, Jan. 27, '94).

In the treatment of iritis the action of atropine is often augmented by the use of the Turkish bath. Claiborne (N. C. Med. Jour., '92).

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The inflammatory conditions necessitating the use of atropine are confined to the eye itself; it is not indicated in inflammations of the appendages. Scleritis and episcleritis will generally yield to appropriate treatment, without mydriasis, also. In keratitis, atropine is indicated because it paralyzes accommodation, thereby relieving the cornea from any action the ciliary muscles may indirectly have on it, and because it acts as an anæsthetic to a limited degree. I have never seen glaucomatous symptoms arise from the use of atropine in keratitis, but conjunctival irritation in this connection is not uncommon.

In iritis atropine is indicated at once, and the sooner the iris is brought fully under its influence the better; and especially is this true of the plastic variety. In serous iritis, without plastic exudation, mydriatics act by dilating the iris, thereby relieving pain. In the plastic variety, not only is this the case, but they also overcome the danger, if used in the onset of the disease, of adhesions being formed between the iris and the anterior capsule of the lens, constituting what is known as posterior synechia. In inflammation of the ciliary body, cyclitis, atropine is indicated as an antiphlogistic and analgesic. In inflammations of the deeper structures of the eye, as in hyalitis, retinitis, choroiditis, and even hæmorrhage, I believe atropine has a place. There is a difference of opinion here, some holding that the enlargment of the pupil from atro-

pine allows more light to enter the eye than is good for the inflamed structures, which is a fact; but the paralyzing of the accommodation, it seems to me, is beneficial, especially when one can exclude the light by means of very dark glasses. The greatest fear to be entertained from the use of atropine—and, in fact, of all mydriatics—is increase of tension; but this should be a desirable aid in case of hæmorrhage from the retinal vessels. In simple optic neuritis atropine is not beneficial.

The contra-indications for the use of atropine can be inferred from what I have already said, but the greatest fear, and one which even the most experienced feels, is the possibility of precipitating an attack of acute glaucoma. Van Fleet (Med. News, Feb. 5, '96).

Clinical study of action of mydriatics and myotics on 12 cases of total oculomotor palsy shows that atropine widened the pupil an additional 1 millimetre to 1 $^1/_2$ millimetres, which is attributed to the action of the mydriatic on nerve-ends and fibres that were not completely paralyzed, rather than to its influence on the sympathetic nerve. Sprio (Centralb. f. prakt. Augenh., Mar., '98).

Atropine should not be used in conjunctival troubles, in glaucoma or increased intra-ocular tension, or as a mydriatic in patients over forty. It is indicated in iritis, keratitis, and corneal ulcer and may be used diagnostically to dilate the pupil and to relax accommodations in persons under thirty or thirty-five years. Marple (Phila. Poly.; Post-grad., May, '98).

Neuralgia. — Atropine gives very satisfactory results in neuralgia, especially in neuralgia of the trigeminus, and in sciatica. In the former, a solution of the drug may be applied externally over the painful area or instilled within the eyelids, or injected, not subcutaneously, but deeply, into the tissues in the neighborhood of the affected nerve-trunk. In sciatica the last method is the best. The largest dose compatible with the safety of the patient must be used (generally $^1/_{50}$ to $^1/_{30}$ grain), and decided curative results may be expected (Bartholow). In traumatic neuralgias, Weir Mitchell asserts that atropine is useless. Earache, when neuralgic in character and not produced by pressure of pus against the tympanum, may be relieved by instilling a few drops of a solution of atropine, previously warmed. Periuterine and dysmenorrhœal neuralgias are relieved by deep hypodermic injections of atropine in solution. Muscular cramp from injuries to the nerve-trunk are often relieved by atropine, injected into the substance of the affected muscle. Hepatic, intestinal, uterine, and renal colic may be relieved by hypodermic injections of atropine, but the best results are reached when morphine and atropine are combined. Vaginismus has been relieved by the topical use of pledgets of lint wet with a mild solution of atropine.

Insomnia.—The insomnia of mental disorders and of delirium tremens may be overcome by the hypodermic injection of atropine when the following indications for its use are present: Coma vigil, great restlessness, weak heart, cold surface, cyanosis, clammy sweat. When there is a condition of hyperæmia of the cerebro-spinal centres (excitement with elevated pulse-rate and increased arterial tension) atropine can only do harm. (Bartholow.)

Asthma.—Atropine in doses of $^1/_{120}$ to $^1/_{60}$ grain, given hypodermically, will relieve the paroxysms of asthma, especially if given at the beginning of the paroxysm. Here the effect is systemic and the injection need not be made over the pneumogastric.

Cutaneous Disorders.—Atropine in solution (4 grains to 1 ounce) may be applied externally in all painful and congested conditions of the skin. Ery-

thematous dermatitis, erysipelas simplex, pruritus of the vulva, anal fissure, etc., may be relieved in this way. The pain of cancerous infiltrations of the skin may be relieved by painting the surface with an atropine solution and, when the skin has become disintegrated through sloughing, lint dipped in a weak solution of atropine and applied to the surface gives relief.

> The troublesome pruritus of icteric and diabetic patients is best dealt with by calmative applications, as a flannel compress saturated with a solution of atropine, 1 to 500, covered with a sheet of oiled silk. Besnier (Bull. de la Soc. de Méd. d'Anvers, May, '91).

Mammary Congestion.—When the glands are swelled or tender, either early in lactation or later, when we wish lactation to cease (on death or removal of infant or weaning), atropine (4 grains to 1 ounce of rose-water) is a clean and efficient remedy to apply to the glands. The gland is first cleaned with soap and warm water, carefully dried, and the solution of atropine applied to the surface (avoiding the nipple and the areola) with a camel's hair brush and allowed to dry. The glands should then be drawn upward and inward (to take off weight and tension) and retained by means of a proper bandage. If preferred, the breast may be enveloped in lint wetted with the above solution. If the pupils dilate and the mouth becomes dry, the application should be removed.

Excessive Diaphoresis.—The night-sweats of phthisis may be checked by the subcutaneous injection of atropine; $^1/_{60}$ grain at bed-time usually suffices (Bartholow). The copious perspiration induced by drugs, such as pilocarpine, opium, alcohol, and other diaphoretics, may be checked by the use of atropine.

Collapse.—Since atropine stimulates the heart and increases the blood-pressure, we find it useful in moderate doses in the collapse of fevers, cholera, sunstroke, and cardiac syncope. The dangerous exhaustion consequent upon colliquative diarrhœa and internal hæmorrhage indicate the use of atropine. It is also valuable for the prevention of shock after operative procedures and anæsthesia.

> The combination of atropine and morphine prior to ether inhalation, injected hypodermically, checks the after-vomiting and is preferable to bromides, chloral, and opium, all of which often fail to produce good results. Rushmore (Jour. Amer. Med. Assoc., Mar. 19, '93).

> Atropine—$^1/_{75}$ to $^1/_{100}$ grain given before the administration of ether—reduces the chances of shock. Case of a women, who, in a preliminary examination, came out of the influence of ether in a deplorable state; three days later, however, when the operation was about to be performed, atropine was given, and she was taken from the table with as good a pulse as before anæsthesia. Lewis A. Stimson (N. Y. Med. Jour., Mar. 9, '89).

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> Atropine by promoting contraction of the arteries antagonizes the dangerous fall of blood-pressure produced by chloroform. It may be used by intravascular, hypodermic, or intravenous injection. Schäfer (Lancet, Feb. 5, '98).

Excessive Vomiting.—Atropine used hypodermically has been found useful in some cases of seasickness and in the vomiting of pregnancy.

Atropine is also available in a variety of other diseases, judging from the evidence adduced.

Cholera Infantum.—Beneficial effects have been obtained by Larrabee by means of hypodermic injections of $^1/_{50}$ grain of atropine followed by calomel and lime-water containing a little car-

bolic acid. Nothing but toast-water was allowed for thirty-six hours.

William Bailey, of Louisville, has found that infants bore atropine well, and gave almost adult doses of atropine to children only a few months old, combining the drug with relatively very small doses of morphine: for instance, $^1/_{80}$ grain of morphine and $^1/_{150}$ grain of atropine, repeated two, three, or four times in twenty-four hours, making the adult dose of atropine. This controls, he states, the phenomena of cholera infantum, which would terminate life perhaps in a few hours without such treatment.

Lauder Brunton observed a case in which a child was collapsed and apparently dying. A subcutaneous injection of atropine revived her for a time. This was followed by relapse; but another injection was administered, with good results, and she recovered.

Influenza. — For the delirium of inanition and allied states, when found as sequelæ of influenza, Sachs found that there was nothing better than subcutaneous injections of atropine and morphine.

Hæmorrhagic Disorders.—Atropine has been highly recommended in many disorders characterized by an undue flow of blood.

> Four cases of uterine hæmorrhage of alarming character, wherein all other methods failed, were controlled by atropine employed hypodermically: $^1/_{60}$ grain repeated in three hours, and a third given twelve hours later. Dimitrieff reports two cases treated in this way with good results. Strizdred (Univ. Med. Mag., Sept., '92).

> In two cases of metrorrhagia this drug acted well as an hæmostatic. One was of a fortnight's standing and had been treated by ergot internally and tampons in vagina; the bleeding completely ceased after four injections—each of $^1/_{200}$ grain of atropine—used twice daily. The other, a most severe case, had been persistently treated by hydrastis Canadensis and ergot internally and ice locally, without avail. Marked improvement followed half an hour after the first hypodermic injection of atropine; the bleeding had notably lessened soon after the second injection, given five hours later, and completely ceased after the third, given twelve hours after the first. Dimitrieff (Revue Scien. et Adminis. des Méd. des Armiés de Terre et de Mere, No. 50, '91; Brit. Med. Jour., May 21, '92).

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> Five cases of uterine hæmorrhages in which atropine sulphate was used with very gratifying results, when the usual remedies failed. Two cases were postpartum, three were simple menorrhagia, and the last from uterine cancer. The dose administered was $^1/_{200}$ grain every two hours, per mouth. W. G. Johnson (Penna. Med. Jour., Feb., '98).

Morphinism.—Kochs, of Bonn, employed subcutaneous injections of atropine as an antidote to morphinism in five cases, diminishing the unpleasant results of abstinence. He says that $^1/_{300}$ grain of the sulphate should be given at first, patient being watched for several hours. A second dose may be given, if necessary. I cannot approve of this treatment. In most cases the quantity of the morphine should be slowly diminished, thus reducing the suffering to a minimum. (Norman Kerr.)

Antidotal Uses.—In opium poisoning Harley advises the use of atropine, in doses sufficient to stimulate the circulation and respiration, whereby the secretion of urine is increased and the elimination of the poison hastened. For this purpose $^1/_{80}$ to $^1/_{60}$ grain should be given hypodermically every hour or two, according to the gravity of the symptoms and the response of the nervous

system to the remedy. The same remarks apply to the treatment of poisoning by calabar-bean (physostigmine—eserine), for which atropine is a more decided antidote.

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In three patients who had formerly suffered from tinnitus aurium due to quinine, the symptoms could, at least, be considerably diminished by adding atropine to the quinine. The amount of atropine prescribed amounted to $^1/_{120}$ grain daily. Aubert (La Méd. Mod., Mar. 24, '97).

INTERNAL USES.—The indications for the internal uses of atropine will be considered under the head of BELLADONNA.

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B

BARIUM.—Barium is not employed medicinally, and is of no interest to physicians except as they may require its aid for purposes of chemical research. So, too, of the fifty salts of the metal, but two—the chloride and sulphocarbolate have ever been employed therapeutically, and even then only in a desultory and incomplete way. The dioxide and sulphide bear a quasirelation to medicine, however, but in a chemical rather than a therapeutic sense, the former being employed in the manufacture of hydrogen dioxide, while the latter finds use, when mixed with starch (1 to 3) and water to the consistency of cream, as a depilatory.

Barium chloride is a white, crystalline substance possessed of a bitter, disagreeable taste. It is readily soluble in water, fairly so in alcohol, and but scarcely at all in absolute alcohol.

Preparations and Dose. — Barium chloride, $^1/_2$ to 2 grains.

Barium sulphocarbolate, $^1/_4$ to 1 grain.

Physiological Action.—A recent work on therapeutics is responsible for the statement that barium chloride in its action upon the circulation resembles both ergot and digitalis: a conclusion that would seem, physiologically speaking, self-contradictory. Hypodermic injections of the chloride of barium, in doses of $^1/_{12}$ grain per pound of the body-weight, produce death in dogs in twenty-four hours after the administration of the drug. With smaller amounts death is more retarded, but the toxic phenomena produced in the meantime are vomiting, diarrhœa, albuminuria with hæmaturia, and convulsions preceding the fatal termination. The most prominent post-mortem lesion found is nephritis with congestion of the glomerules, hæmorrhages in the tubes, and lesions in the cells of the labyrinth. These lesions are different from those caused by mercury; they consist of a granulo-fatty infiltration of the secretory epithelium of Heidenhain. Traces of hæmoglobin are found in the cells, this hæmoglobin soon passing into the secreting cells and afterward into the urine. These histological changes explain the phenomena observed during life: albuminuria and hæmoglobinuria. (Pilliet and Malbec.)

Barium chloride exerts its chief influence on the heart and resembles very closely in its effects those of digitalis. In the frog small doses increase the action of the heart-muscle, and large doses arrest this viscus in systole. The interesting fact was discovered that a heart

arrested by muscarine or chloral was started again by using this salt, and it was also found that the strongest electrical stimulation of the vagi failed to relax the systolic spasm. Furthermore, it was proved that this loss of inhibitory control was not due to a depression of these nerves, but to the direct cardiac effects. In warm-blooded animals the drug slows the heart solely by its action on this viscus, but if very large doses are given there is a primary acceleration of the pulse, probably due to stimulation of the accelerator nerves. Finally, this is replaced by slowing caused by direct depression of the heart-muscle. Barium also increases to a marked extent arterial pressure, and, like pilocarpine, increases the secretion of saliva. (Bary.)

The foregoing is also borne out by studies made by Ringer and Sainsbury.

The physiological action of the sulphocarbolate has not been investigated.

Therapeutics.—Barium chloride has been tried externally in a multitude of maladies, but in such a way that it is hardly safe to attempt to deduce conclusions of a definite character therefrom. Even in the latter part of the last century an ointment of this salt was suggested as a remedy for scrofulous tumors; later it was tried—as have been most salts—as an application to goitrous swellings; recently Kobert, of Dorpat, attempted to relieve dilated cutaneous veins by application of a solution incorporated with lanolin, "but without result." Strange to say, a late work on materia medica and therapeutics gives Kobert's evidence as favorable instead of unfavorable, the error arising probably from the fact that Bartholow rendered a report opposed to that of the Russian observer.

Internally the medicament appears, when given in minute dose, to be both alterative and stimulant. It has been employed in a variety of diseases, and is, by no means, new, since as early as 1789 Crawford recommended it to be administered to scrofulous patients and applied as an ointment to scrofulous swellings of the neck; half a century later Walsh suggested it as a substitute for iodine in like cases. Cases of the cure of aneurism by this salt have been reported in current medical literature.

Da Costa holds that in valvular disease of the heart it is both a general and cardiac tonic, "diminishing and relieving cardiac distress, increasing the tone of the blood-vessels, and producing diuresis; also that it is a remedy that can be taken for a long time without danger or disordering the stomach." This is denied, however, by Bardet, who also chronicles a death after ten days' use of the drug, in which but $^1/_4$ grain was ingested daily—total, $2\,^1/_2$ grains. This would indicate necessity for the greatest caution when administered internally.

Several writers have also lauded barium chloride in functional heart maladies, but the evidence adduced is inconclusive. Brown-Séquard tried it in epilepsy with negative results; but it appeared to him to be of value in tetanus and paralysis agitans. Another author recommends it in diffuse and multiple cerebral sclerosis, but without even a suggestion as to the *rationale* thereof.

> It has been administered in various cutaneous diseases in doses of ½ grain three times daily, and is said to cure the irritable forms of dry eczema after arsenic has failed. Mineral waters containing barium salts have long enjoyed a reputation for efficacy in skin diseases. Armstrong (Foster's "Practical Therapeutics").

Barium sulphocarbolate, like most sulphocarbolate salts, has been employed in the colliquative diarrhœas of children,

especially those suffering from rachitis, and in gastro-intestinal disturbances, but it is impossible, as yet, to draw conclusions from the few incomplete reports that have been rendered.

BARLOW'S DISEASE. See SCURVY, INFANTILE.

BELLADONNA.—Belladonna (deadly-nightshade) is a solanaceous plant, botanically known as *Atropa belladonna*, Linné. It is indigenous to southern Europe and central Asia. Two parts of the plant are used in medicine: the leaves and root. The preparations are extract (solid) and tincture of the leaves, and fluid extract of the root. Belladonna plaster and belladonna ointment are made from the extract of the leaves, but belladonna liniment is made with fluid extract of root. The active principle is the alkaloid atropine, which occurs in the plant in combination with malic acid as bimalate. Another principle, analogous to atropine and possessed of mydriatic properties, is obtained from the mother-liquor, after atropine has crystallized out, which is called "belladonnine," the latter being an amorphous, brown, varnish-like mass, freely soluble in chloroform and slightly soluble in water. Atropine is used in all cases where is desired an immediate and rapid action, as when a patient cannot swallow, and when the stomach will not tolerate belladonna or its preparation. Belladonna and its preparations are preferred when a slow and more continuous action is desired.

Dose and Physiological Action.—The dose of belladonnæ foliorum is 1 to 5 grains. Of belladonnæ radix from 1 to 3 grains may be given. The extractum belladonnæ foliorum is given in doses of $^1/_{10}$ to $^3/_4$ grain. The dose of extractum belladonnæ radicis fluidum is from 1 to 3 minims, and of the tinctura belladonnæ foliorum is from 5 to 15 minims. The physiological action of belladonna has been already described in the article on ATROPINE.

Belladonna Poisoning. — The symptoms of poisoning by belladonna appear usually within two hours, and are similar to the poisonous effects of all the solanaceous plants (stramonium, or thorn-apple; Jamestown weed; hyoscyamus, or henbane; *Solanum dulcamara*, or bitter-sweet; woody-nightshade, etc.). The characteristic effects, stated briefly (fuller description has already been given in article on ATROPINE), are frequently flushed face, redness of the skin, heat and dryness in the throat, dilatation of the pupil, sensory illusions, and active delirium. Death, when it occurs, usually takes place within twenty-four hours. A few berries of belladonna and one drachm of the extract have proved fatal. The post-mortem appearances are not constant or well marked. The pupils are dilated. The brain may be congested and the stomach inflamed. The remains of the leaves or berries should be searched for in the stomach and intestines.

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Incompatibility or antagonism of the coal-tar preparations and any forms of belladonna noted. If either is being taken and the other is given, delirium is produced at once. Several cases observed with the same result. J. R. Nelms (Med. Brief, Feb., '98).

Effect of belladonna upon the human vision was considered in a libel suit recently reviewed by Appellate Division of the Supreme Court at Albany, New York. The plaintiff was a physician who treated the defendant's daughter for some ailment of the eyes, and in the course of the treatment administered belladonna. The girl subsequently became blind, and her

father attributed the loss of her eyesight to the unskillfulness of the plaintiff and his ignorance in giving her belladonna and thus producing her blindness. The doctor sued him for libel for publishing statements of this purport. Every medical witness testified that belladonna would not, and indeed, could not cause blindness in any person. They all agreed that the drug produced a dilation of the pupil, accompanied by a partial loss of vision, but that this was only temporary and the effect would gradually pass away. Proof on this point was so clear and conclusive as to leave no doubt in the mind of the Appellate Court that the unhappy father was mistaken in holding the doctor responsible for the misfortune of his child. Editorial (Med. Standard, May, '98).

Treatment of Belladonna Poisoning.—The treatment of poisoning by belladonna is the same as that outlined for atropine poisoning: Evacuation of the stomach by emetics or stomach-pump. Morphine ($^1/_8$ to $^1/_2$ grain) should be given hypodermically, repeated at intervals according to the urgency of the symptoms and the response to the remedy. Pilocarpine ($^1/_8$ to $^1/_4$ grain) or eserine ($^1/_{200}$ to $^1/_{60}$ grain) may be used in the same manner. When the patient shows signs of improvement, castor-oil may be given to evacuate the bowels and remove any remaining particles of the poisonous leaves, berries, or root. Strong coffee and alcohol are useful agents if the patient is conscious and can swallow.

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Case of a man, aged 45, who took, on an empty stomach at 5.30 A.M., a little over an ounce of glycerinum belladonnæ: the equivalent of about 3 grains of atropine. Treated by apomorphine, strychnine, and morphine subcutaneously. Recovery occurred after twenty-four hours. There was no maniacal excitement, but delirium and coma; the first prominent symptom was muscular ineo-ordination. The experiments of the Edinburgh committee go to show that morphine is not antagonistic to atropine, although atropine is to morphine; but one or two cases are on record where morphine by subcutaneous injection relieved the symptoms of atropine poisoning. One case is specially mentioned by Binz where a boy had eaten the seeds of *Datura stramonium*, the alkaloid of which is in many respects identical with atropine. In this case death seemed inevitable, and as a last resource morphine was administered, with the result that the grave symptoms were arrested, and the boy speedily recovered. In the case just recorded there seemed to be undoubtedly great benefit derived from morphine, as the delirium and hallucinations subsided almost immediately, and remained permanently in abeyance. Duncan (British Med. Jour., May 8, '97).

Case of a woman confined three or four days before. Found a slight rash all over the body, which had the appearance of measles, and somewhat crescentic in character; temperature a little over 101°. On inquiry learned an ointment containing extract of belladonna was being used on breasts with a view to getting rid of her milk. It was a belladonna rash. Have seen several cases of belladonna poisoning from the local application of belladonna liniment. Campbell (Montreal Med. Jour., Dec., '96).

Therapeutics. — GASTRO-INTESTINAL DISORDERS.—Mercurial ptyalism and the ptyalism of pregnancy may be relieved by the tincture of belladonna given in doses of 5 to 10 drops every four to six hours. Gastralgia and the pain of gastric ulcer are relieved by atropine. Bartholow suggests the following:—

℞ Atropine sulph., $^1/_5$ grain.
Zinc sulph., 30 grains.
Distilled water, 1 ounce.—M.

From 3 to 5 drops twice or thrice a day.

He recommends a similar combination as very effective in pyrosis, chronic gastric catarrh, and irritative dyspepsia.

Vomiting of pregnancy may be relieved by the internal administration of $^1/_{120}$ grain of atropine sulphate, in water, before meals; if the stomach is irritable, the atropine may be given in suppository, or, dissolved in chloroform (1 to 96), it may be used on lint applied to the epigastrium. Habitual constipation may be relieved by $^1/_6$ to $^1/_2$ grain of the extract in pill, taken at bed-time. (Trousseau.)

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It is evident that neither belladonna nor atropine is indicated in the treatment of constipation dependent upon intestinal atony. They can be used with advantage, however, in all the painful and spasmodic attacks which result from hyperexcitability of the nervous apparatus which presides over the contraction of the intestine. Traversa (Il Policlinico, No. 24, '97).

Added to other purgatives it diminishes their griping action, and, since it increases peristalsis and allays spasm, it increases their efficiency. When there exists a torpor of the lower bowel aloin is a valuable addition. An excellent combination is

℞ Aloin,
Ext. nux vomica,
Resin podophyllin, of each, $^1/_2$ grain.
Ext. belladonna, $^1/_4$ grain.

Make 2 pills. One or two at bed-time. Heart-burn and water-brash may be relieved by atropine ($^1/_{196}$ grain) combined with 5 drops of dilute muriatic acid, well diluted and taken before meals.

Fevers.—Belladonna has been used with good results in typhus and typhoid fevers. Graves suggested that the contracted pupil was an indication for its use. Bartholow advises it when there is much low, muttering delirium, subsultus, and stupor, but cautions against its use in the condition of delirium ferox. The tincture may be used in doses of from 5 to 10 drops every four hours.

Disorders of the Air-passages.—Acute coryza may be aborted through the use of the tincture of belladonna, 5 drops being given at first and 1 or 2 drops every succeeding hour, until the physiological effects are produced. In pharyngitis with increased secretion similar treatment is efficient; if there is much fever 1 drop of tincture of aconite with 2 drops of tincture of belladonna may be given every hour or two. Aphonia, due to fatigue of the vocal cords, may be removed very speedily by a morning and evening dose ($^1/_{120}$ to $^1/_{80}$ grain) of atropine; hysterical aphonia may, not infrequently, be quickly cured in the same way. (Bartholow.)

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I have long regarded the mucous expectoration in bronchitis, whether viscid and vitreous or profuse and watery, as rather an increased secretion than an inflammatory product, and this view is supported by the promptness with which tincture of belladonna, in 10-minim doses thrice daily or oftener, checks the secretion and relieves an incessant and troublesome cough. By this experience I have been led to administer belladonna in cases of bronchitis following ether inhalation, and, although my cases are few, yet the success has been sufficient, I think, to draw attention to this treatment, that others with more opportunities may test the efficacy of belladonna. I would also suggest that belladonna should be given to patients who, after aspiration, suffer from an abundant watery expectoration, so profuse sometimes as to kill by suffocation. Sydney Ringer (Brit. Med. Jour., Nov. 21, '96).

Spasmodic Disorders.—In pertussis belladonna may be considered one of the most reliable remedies. As Bartholow suggests, it is not adapted to all

cases, but is most effective in the spasmodic stage and in those cases which are characterized by profuse bronchial secretion. He recommends an aqueous solution of atropine sulphate (1 to 480), giving 2 to 4 drops at a dose. The tincture of belladonna may be given in doses of from 3 to 5 minims every three or four hours, stopping when there is a perceptible dilatation of the pupils, or even slight reddening of the skin. The dryness of the throat and mouth may be relieved by small doses of the iodides, by small doses of wine of ipecac or antimonial wine, by occasional small doses of calomel, or by ammonium chloride. Westbrook suggests the following:—

℞ Tinct. belladonna, 3 to 5 minims.
Alum, 1 drachm.
Syrup of Tolu, 1 ounce.
Water, 2 ounces.—M.

Of this mixture the child may be given a teaspoonful every two or three hours, day and night, if it is awake. When the spasm is marked and very frequent the following is used:—

℞ Tinct. belladonna, 3 minims.
Tinct. camphorated opium, 2 to 4 drachms.
Muriate of ammonium, 1 drachm.
Bromide of ammonium, 2 drachms.
Syrup of wild cherry-bark, enough to make 3 ounces.—M.

Of this a teaspoonful, diluted, is given every two or three hours, night and day, if the child is awake. Forchheimer advocates the use of quinine in conjunction with belladonna.

In pertussis, when a complication of measles, belladonna pushed to its physiological effects acts well. Bernardy (Annals of Gyn. and Pæd., July, '94).

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Belladonna *per se* will relieve pertussis. The younger the child, the better the drug acts. It takes proportionately a larger dose to produce toxic symptoms in a child than in an adult. The drug is given every hour unless marked dilation of the pupils is produced. Garrison (Med. News, June 12, '97).

In asthma and in the dyspnœa which accompanies emphysema belladonna gives great relief. According to Bartholow's observations, when the bronchial secretion is deficient, the pulse much accelerated, and the skin dry and hot, belladonna adds to the distress; its good effects are noticed when the expectoration is abundant, the skin cool and moist, and the pulse quiet and of low tension. For the relief of the paroxysm the hypodermic administration of atropine, or of atropine and morphine combined, is to be preferred to medication by the stomach, as the latter is too slow. After the paroxysm is relieved, the effect may be prolonged by internal medication. Belladonna-leaves may be used by the method of fumigation. The leaves previously dipped in a saturated solution of nitre and then dried may be burned in a close apartment, or on a saucer, the fumes being inhaled from a paper funnel covering the same. Pastilles made of belladonna, stramonium, poppy, tobacco, etc., may be used. Trousseau gives a formula for asthmatic cigarettes:—

℞ Belladonna-leaves, 5 grains.
Stramonium-leaves,
Hyoscyamus-leaves, of each, 3 grains.
Extract of opium, $^1/_5$ grain.
Cherry-laurel water, a sufficient quantity.

The leaves are moistened with a solution of the opium in the cherry-laurel water, and when dry made into a cigarette. Two to four such cigarettes may be smoked daily.

A person liable to attacks of asthma should be classed with those who have fits of epilepsy and occasional attacks of sick headache. They have unstable nerve-centres, likely to explode their energies at any moment, and exhibit the pathological phenomena peculiar to nerve-storms. Treatment should be directed to break up this habit morbidly acquired by the nerve-centres, and by prolonged medication to maintain the centres in a state of more stable equilibrium. This is done very successfully in epilepsy, and can also be done in asthma. I give, for this purpose, chloral and belladonna night and morning, or, at least, at bed-time, and finds that, after a time, the attacks diminish in frequency and lessen in severity. Pearse (Practitioner, Jan., '93).

Belladonna is useful in the treatment of spasmodic cough and in spasmodic croup, given between the paroxysms; more rapid measures are needed for the relief of the paroxysm itself.

In the treatment of nocturnal incontinence of urine, no single remedy has given such good and uniform results in suitable cases as belladonna. This distressing ailment may be caused by hyperacidity of the urine, relaxed condition of the sphincter vesicæ, or to an irritable condition of the vesical mucous membrane; belladonna gives prompt relief in the two last-named conditions. In male children phymosis, accompanied often by adhesion of the prepuce to the glans penis and retained smegma, is a frequent cause of incontinence; in these circumcision and not belladonna is indicated. Again, the presence of ascarides may be sufficient to cause nocturnal incontinence, especially in female infants and children; here again belladonna is of no avail. In suitable cases, as indicated above, atropine, in solution or in tablets, is best suited for internal administration. Beginning with a small dose, at bed-time, the dose is gradually increased until systemic effects are produced. It must be remembered that as regards children generally too little of the drug is given. After the relief or cure of incontinence the best results are obtained by continuing the use of the drug for several weeks, in diminishing doses, with an occasional intermission of one to three days, during which time it is not given. This advice holds good in treating spasmodic disorders generally.

In spasmodic conditions of the rectum associated with fissure, hæmorrhoids, cancer, chronic constipation, etc., a small suppository (6 to 10 grains), containing from $^1/_4$ to $^1/_2$ grain of the extract, introduced well up into the rectum beyond the internal sphincter, gives great relief.

In volvulus belladonna employed with opium in full doses until constitutional effects shown, for peristaltic paralysis due to tympanites or fæcal accumulation. May be combined with calomel. Sodium sulphate in hourly doses of 1 to 2 drachms. Lavage-tube for bowel-flushing. Stokes (N. Y. Med. Jour., No. 1778, '95).

In intestinal obstruction and strangulation I have known relief to follow elevation of the pelvis on a firm pillow so as to allow gravity to act toward the thorax; and with this treatment, combined with starvation, and the use of belladonna and opium, I have had cases of natural recovery. Belladonna may be used externally also with glycerin, and in suppository with gelatin. Thomas Bryant (Lancet, Jan. 17, '91).

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In lead colic, whether due to direct excitation of the intestinal ganglia or of the abdominal fibres of the vagus, or to simple accumulation of hard and dry fæces in the intestine, from reflex action upon the contraction of smooth muscular fibres consecutive to primary irritation of the sensory nerves, belladonna or its alkaloid, by diminishing, more or less completely and in different degrees, the

irritability of the peripheral nervous apparatus, takes away an indispensable factor whereby abnormal stimuli operate through the nerves in increasing the contractility of the smooth muscular fibres. Traversa (Il Policlinico, No. 24, '97).

In pelvic affections of women, attended by hyperæmia, pain, and spasm; a larger suppository (30 to 60 grains), containing from $^1/_2$ to 1 grain of the solid extract, may be introduced high up within the vagina and retained by means of a tampon of non-absorbent cotton, at night; in the morning a hot-water vaginal douche will add to the comfort and well-being of the patient.

In dysmenorrhœa, belladonna given with the advent of pain relieves by relaxing the spasms. Handfield-Jones (Brit. Med. Jour., May 27, '93).

Epilepsy.—Belladonna, according to Trousseau and Pidoux, is a more efficient remedy in the treatment of epilepsy than the salts of silver, copper, or zinc. Both insist that belladonna should be given steadily for a year in gradually-increasing doses, and that if amendment is then produced it should be continued through two, three, or even four years. The best results from the use of belladonna are obtained in nocturnal epilepsy, in *petit mal*, and in pale, delicate, and anæmic subjects, with cold hands and feet, blue skin, and weak heart (Bartholow). Nothnagel advises a combination of zinc oxide with the belladonna, the former in gradually-increasing doses. Moeli has advised an alternation of atropine and bromides as very effective, on the analogy of the opium-bromide treatment. Belladonna is not equal to the bromides in diurnal epilepsy, in epilepsy accompanied by cerebral hyperæmia, or in epileptiform convulsions due to an organic lesion of the brain. More effectual than the atropine is Trousseau's method: During the first month the patient takes a pill—composed of extract of belladonna and powdered leaves of belladonna, of each, $^1/_5$ grain—every day, if his attacks occur chiefly in the day-time; or in the evening, if they are chiefly nocturnal. One pill is added to the dose every month; and, whatever be the dose, it is always taken at the same time of the day. The dose may thus be increased from 5 to 20 pills or more. If this treatment fails to cure, it yields much relief.

Belladonna may, in grave cases of epilepsy, bring about a prolonged suspension of attacks analogous to that produced by bromides. Féré (Journal des Connaissances Méd. Prat. et de Pharm., Nov. 21, '95).

Cerebro-Spinal Disorders.—Belladonna and atropine have been found useful in the treatment of epidemic cerebro-spinal meningitis, the basilar meningitis of children, and the various acute forms of myelitis, etc. In cerebro-spinal meningitis, in which, so long as consciousness exists if there is great pain, the addition of opium or morphine to the belladonna or atropine increases its efficacy.

Neuralgia.—The ointment or plaster of belladonna is a useful application in neuralgia of various forms (mammary, intercostal, cervico-dorsal, etc.) A few drops of aconite used to moisten the surface of a belladonna plaster before applying will in most cases increase its efficiency. (See Atropine.)

Miscellaneous. — Belladonna has also been recommended in a variety of disorders other than the foregoing, prominent among which are cystitis, hysteria, migraine, and angina pectoris.

In acute cystitis the first indication in treatment is to allay tenesmus and

pain. The following suppository should be used every four hours:—

℞ Morphine muriate,
Cocaine hydrochlorate, of each, $^1/_6$ grain.
Extract of belladonna, $^1/_{12}$ grain.
Cocoa-butter, 46 grains.

In women the topical application may be in the vagina, as it combats the cystitis of the neck. Lutaud (Jour. de Méd., July 22, '94).

In hysteria in children belladonna, in doses of $^1/_6$ grain of the extract, is useful, especially for the visceral pains. Simon (Med. and Surg. Reporter, May 5, '94).

I have obtained the best results from the use of belladonna, or its active principle in the treatment of migraines due to a vasodilated condition of the part affected. Liégeois (Revue Méd. de l'Est, Nov. 15, '90).

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In order to obtain the desired effect from belladonna, very small doses should be given at frequent intervals. When given in this manner in fevers, or hypodermically in cholera infantum and pernicious intermittents, it has proved a most valuable remedy. As a stimulant to the respiratory nerve-centres it has a place in pneumonia, and in enuresis it gives excellent results, if the doses are increased until a toxic effect is obtained. To augment peristalsis, it should be used in suspected fæcal or mechanical obstruction of the bowel. In the so-called spurious hydrocephalus it is beneficial in maintaining cerebral vitality. I have many times by its use averted coma in typhoid fever after Cheyne-Stokes respiration was present. Larrabee (Pediatrics, Sept. 1, '96).

In angina pectoris Massy extols belladonna or its alkaloid, but Huchard denies any good effects and adds: "It disturbs the mechanism of the heart and contracts the arteries," which seems most tenable, being in line with the known physiological action of the drug.

Cutaneous Disorders.—Belladonna is useful in certain affections of the skin, in the cutaneous neuroses, prurigo, herpes zoster, erythema, and eczema. Sufficiently large doses to maintain a mild physiological action must be used. Hyperidrosis and unilateral sweating are arrested by the internal or by the local application of the belladonna preparations.

[The use of atropine in relieving the sweats of phthisis has been referred to under Atropine.—Ed.]

In a case of pemphigus, in a boy aged 15 years, 3 drops of tincture of belladonna, three times a day were given; at the end of a week increased to 4 drops. Decided improvement now set in, and for about a week no new vesicles formed. A few new blisters then appeared, and the belladonna was increased up to 6 drops three times daily. One of the best-known actions of belladonna is its power of controlling perspiration, and in doing this it put the lad's feet in the same condition in this regard in summer as in winter. Montgomery (Med. News, Nov. 16, '95).

For the pruritus of lichen, fractional doses of tincture of belladonna; give 1 to 4 drops, three times a day. If an urticarial element exists, quinine with ergotine may be used where belladonna fails. Brocq (Gaz. des Hôp., Feb., 20, '92).

In doses of from $^2/_{13}$ to $^1/_3$ grain of the extract, belladonna is the best remedy in chronic urticaria, which appears to be due to an acute œdema of the connective tissue of the skin as the result of active vasomotor dilatation. Liégeois (Revue Méd. de l'Est, Nov. 15, '90).

External Uses. — Belladonna used externally (liniment, ointment, or plaster of belladonna; or atropine) in solution is of value in the treatment of swollen lymphatic, parotid, and other salivary glands and the mammæ. It may be applied over sprained or inflamed joints. The application of a mild sinapism, to redden the skin slightly, will

increase the efficiency of the belladonna. In blepharospasm the extract or ointment may be rubbed on to the eyelids externally.

> In recent typhlitis with acute exacerbations give full warm baths, lasting half an hour; every hour a teaspoonful of a purgative mixture made up of 1 part each of castor-oil and oil of sweet almonds and 2 parts of syrup of lemon, until active purgation is established; mercury and belladonna ointment over the cæcum; and then hot linseed-meal poultices. For recurrent typhlitis there should be treatment in the intervals with a diet that leaves little residue, and with counter-irritation and belladonna ointment over the cæcum, the bowels being kept regulated and intestinal antiseptics administered. Grasset (Revue Gén. de Clin. et de Thér., Dec. 6, '93).
>
> In ileus apply a compress of fifty square centimetres [about three inches square, Ed.] coated with belladonna extract mixed with a little vaselin. If, some hours after this application, symptoms of atropinism supervene, an enema of ox-gall is given, which often relieves intestinal obstruction. In appendicitis, after the acute period, a compress eight by three inches, coated with extract of belladonna and potassium iodide, of each, 1 drachm: lard, 1 ounce, is useful; the action of potassium iodide on the skin promotes the absorption of the belladonna extract contained in the ointment. A suppository containing 1 grain of belladonna extract should also be used every eight hours. As soon as the first symptoms of intoxication appear, a soap enema with ox-gall and sodium carbonate should be administered; this produces a copious and easy stool without irritating the affected intestine. Byers (American Medico-Surg. Bull., Jan. 15, '94).

C. Sumner Witherstine,
Philadelphia.

BENZANILID.—Benzanilid occurs in the form of a white, crystalline powder or colorless scales. It is soluble in alcohol, slightly so in ether, and almost insoluble in water. It melts at 321.8° F., possesses no odor, but has a slightly caustic taste.

Dose.—Five to 15 grains for adults and 1 to 6 grains for children.

Physiological Action.—Benzanilid resembles acetanilid in its action. Its effects manifest themselves from a half to one hour after its administration. It depresses febrile temperature, and the pulse is rendered more slow and soft.

Its action is cumulative, and to the urine a greenish or blackish color is imparted. It is thought to be less toxic than acetanilid and is therefore preferred by some physicians in the treatment of children.

Therapeutics.—Benzanilid is used principally as an antipyretic, especially for children.

> Benzanilid is superior to all other known antipyretics. Luigi Cantu (Riforma Med., Aug. 2, '92).

It has been employed in typhoid fever, malaria, pneumonia, and rheumatism with varying results. In rheumatism it relieves the pain, but does not prevent extension of the local manifestations.

BENZOIC ACID.—Benzoic acid is a peculiar principle and is had from many different sources. It is made by oxidation of toluene with nitric acid, which is the most common form. It is derived, also, from the different benzoins, Asiatic and American; from urine, etc. The best, however, is that made from Siamese benzoin, technically known as pheniformic acid, and presents white, pearly plates or needles, though with age and exposure to light it sometimes acquires a slight-yellowish tinge. It possesses an agreeable aromatic odor and taste, and is soluble in the proportions of 1 to 500 in cold and 1 to 15 in boiling water;

1 to 2 in alcohol; 1 to 3 in ether; 1 to 7 in chloroform; 1 to 10 in glycerin. Borax or sodium phosphate increases its solubility in water. With different bases it forms very soluble salts.

Preparations and Doses. — Benzoic acid, 10 to 30 grains.

Benzoate of ammonium, 10 to 30 grains.

Benzoate of bismuth, 10 to 20 grains.

Benzoate of calcium, 5 to 15 grains.

Benzoate of iron, 2 to 6 grains.

Benzoate of lithium, 15 to 30 grains.

Benzoate of mercury, for external use only.

Benzoate of potassium, 5 to 20 grains.

Benzoate of sodium, 30 to 120 grains.

Benzoate of zinc, for external use only.

Physiological Action. — Externally benzoic acid and, in less degree, its salts are irritant, and the vapors when inhaled tend to bronchial irritation and catarrhal inflammation. Internally administered in ordinary therapeutic doses it exerts no untoward effects except, perhaps, to provoke a moderate amount of gastric irritation with resultant nausea and vomiting. Sometimes there is acceleration of the heart's action and of respiration.

> Schreiber took in two days about ½ ounce of the acid, and experienced only a feeling of abdominal warmth, spreading over the whole body, and accompanied by an increase of the pulse-rate amounting to 30 beats per minute; also increased reaction and excretion of phlegm, with slight disturbances of digestion. H. C. Wood ("Principles and Practice of Therapeutics," ninth ed.).

Benzoic acid and the benzoates are eliminated mainly by the kidneys, partly as benzoic acid, but chiefly as hippuric acid. The exact method by which the latter acid is produced constitutes one of the great problems of physiological chemistry, though the change is generally presumed to take place in the kidneys; certainly it does not happen in the intestines or in the blood.

The benzoates generally, yet in less degree, evince much the same action as the acid. The ammonium salt borrows from its base a neutralizing action upon acids and increases the activity of the kidneys. Benzoate of bismuth resembles other salts of the same base. Calcium benzoate, as might be expected, combines in a measure the action of both base and acid. As it is unofficial, and in little use or repute, it demands no further mention. The same remarks practically apply also to the iron salt. The lithia salt is supposed to possess a special affinity for uric acid and urea, dissolving the one and eliminating the other, but the claims made in this direction are by no means substantiated. It is eliminated by the kidneys the same as benzoic acid, but more frequently yields succinic instead of hippuric acid: a phenomenon that is most puzzling. Potassium benzoate presents nothing from a physiological stand-point that does not accrue to other salts, except it is more difficult of elimination than the sodium salt; the latter most closely resembles the acid in its action, but is more readily absorbed and more continuous in it effects.

Therapeutics. — Benzoic acid externally employed is an antiseptic of considerable value, and both benzoate of bismuth and benzoate of zinc have been lauded and exploited in connection with surgical dressings. All are practically unobjectionable and devoid of unpleasant odor; hence may be made available when more acrid and unpleasant agents are inhibited. Indeed, there is little doubt, in antiseptic surgery benzoic acid might in a majority of instances be substituted for carbolic or salicylic acid with benefit. Friar's balsam—balsamum trau-

maticum of the old pharmacopœias—was formerly in great repute as a vulnerary, and the experiences of Mr. Bryant, of London, evidences its value: He, when confronted with a compound fracture or other severe wound, dresses with lint thoroughly saturated with this compound tincture of benzoin and maintains absolute quiet with non-removal of dressing for several days; and his results challenge those obtained by the most complicated antiseptic dressing. It is, perhaps, needless to remark that the value of the tincture, or "balsam," lies in its contained benzoic acid.

Internally, also, the acid is an antiseptic of no mean value; the salts also in proportion: though the best, when desired to exhibit for this purpose alone, is undoubtedly the benzoate of bismuth, which contains about 25 per cent. of the acid, and if desired may be given in quite large doses, even larger than those here indicated. Either the acid or this salt in medicinal doses is comparatively innocuous. As an antipyretic, too, benzoic acid has won some reputation and it is as infinitely to be preferred for this purpose over salicylic acid, as are its salts above those of the latter.

In the treatment of cystitis, with alkaline or ammoniacal urine, the acid has won golden opinions, though here its ammonium salt is generally preferred as being more active and less likely to disturb the stomach.

In conditions of urinary alkalinity short of phosphatic cystitis, ammonium benzoate is very beneficial, the condition of irritability of the bladder or incontinence of urine associated with an alkaline urinary reaction being almost invariably relieved by its administration. (Foster.)

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From its neutralizing and diaphoretic properties it is useful in all affections where alteration of the blood is added to acidity of the secretions, as in typhoid fever; in virtue of its diuretic qualities in certain forms of dropsy; and it may also be indicated as a solvent of stony concretions, in uric-acid gravel, and in gout. As a stimulant and sudorific it may be used with good effect in atonic arthritic affection; finally its property of stimulating the bronchial mucous membrane renders it useful in certain forms of catarrh. Von Rentergl.em and Laura (Dosimetric Med. Review, Oct., '97).

It is said to sometimes act very happily in acute gonorrhœa, but it must be admitted that it is a somewhat uncertain remedy. The bismuth salt may, however, substitute other bismuth preparations in preparing injections.

Benzoate of lithia is very soluble in water and has been recommended in painful arthritic affections of the joints. Clement prefers it to either the salicylate or carbonate. It is an excellent diuretic, and certainly is often useful in the management of chronic gouty or rheumatic conditions. Its use has also been proposed in the management of uræmic cases, while it may be of service in relieving local manifestations; in the main, it is not to be depended upon.

Benzoate of sodium is the most widely employed of all the salts, that of lithia, perhaps, excepted,—probably, as before remarked, because it more nearly resembles benzoic acid in physiological action. Bucholtz claims that it even surpasses the acid as an antizymotic. At one time it was heralded as a specific in pulmonary tuberculosis; but, like other specifics with similar claims, it was quickly relegated to desuetude.

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It is an excellent diuretic which stimulates the mucous membranes in general, except those of the liver, and it tends to increase and promote organic exchange. It is frequently indicated in uric and hippuric diatheses, in general, and in gouty affections. It is to be recommended equally in subacute and chronic rheumatisms, and some authors appear to have employed it with equal success in acute rheumatism. In the chronic variety it is well to associate it with the salts of lithia, with which we have had most excellent results. Von Renterghem and Laura (Dosimetric Med. Review, Oct., '97).

It has been employed, more especially in Germany and Scandinavia, in the management of certain infectious diseases, notably mumps, whooping-cough, measles, scarlatina, and diphtheria, and even claimed, when the administration is begun prior to the period of incubation, to be a prophylactic to all. But the evidence adduced is of a somewhat flimsy character and requires better confirmation. Lutzerich and Klein used it in conjunction with calcium sulphide in diphtheria, with apparently most favorable results: but those who have had much experienced in treating this malady realize how unsafe it is to draw deductions of a positive character from results accruing to a few cases in one epidemic.

Follicular Tonsillitis.—In affections of the throat it is used extensively. It is especially valuable in follicular tonsillitis.

In 100 cases of acute follicular tonsillitis 4 to 15 grains of benzoate of sodium were given every one or two hours. The duration of the disease was shortened from twelve to thirty-six hours instead of lasting two to five days, as is usually the case. In some instances the white, cheesy points disappeared in eight to ten hours. L. C. Boislinière (St. Louis Courier of Med., Feb., '88).

Pharyngitis and Laryngitis. — In pharyngitis this medicament favorably modifies the pain, dysphagia, and inflammation of the pharynx, and often cures the affection in two or three days. In such cases it may be given in doses of 1 drachm to children, and 3 drachms to adults, in the course of the day.

In laryngitis it is a good expectorant when administered at the beginning of the disease. Liégeois (Med. Press and Circular, Aug. 24, '92).

Gravel.—In uric-acid gravel salicylate of sodium, as does benzoic acid, changes the insoluble urates into soluble hippurates, and thus eliminates the acid from the urine.

In the treatment of Bright's disease, and as a cholagogue, this drug has been found of much service.

BENZOIN.—Benzoin is a gum or balsamic resin, the concrete juice of the *Styrax benzoin*, a large tree, native of Peru. It appears in lumps, agglutinated together, yellowish brown in color, with a milk-white interior. Benzoin has an agreeable balsamic odor, and a slight aromatic taste. It is easily pulverized, the process being apt to excite sneezing. It is almost wholly soluble in five parts of moderately warm alcohol and in solutions of the fixed alkalies. Its chief constituents are resin and benzoic acid.

Dose.—Benzoinated lard (U. S. P.), 2 per cent., is used as the basis for benzoin ointments; tincture of benzoin, 10 to 40 minims; compound tincture of benzoin, 15 minims to 1 drachm.

Physiological Action.—Benzoin possesses antiseptic properties, and the added stimulating effect upon mucous membranes explains its value in the

treatment of diseases of the respiratory tract. It is used principally in pharmacy for the preparation of benzoic acid.

Therapeutics.—Benzoin was formerly employed as an expectorant in pectoral affections, but has fallen into disuse. In the treatment of diseases of the upper respiratory tract, however, it has maintained a well-deserved reputation.

Acute Laryngitis.—In this disease rapid results are attained by the use of inhalations of the steam of a pint of hot water, containing 2 drachms of the tincture of benzoin, provided the patient is given at the same time 5 grains of the benzoate of sodium every two hours. The hot solution of benzoin is placed in a previously warmed vessel and, the latter being covered with a towel folded into a cone, the patient inhales through the upper opening of the latter. (Sajous.)

Anal Fissure.—The tincture of benzoin is being strongly recommended in anal fissure. It is used to paint over abrasions and excoriations in order to protect the surface.

Chapped Hands and Fissured Nipples.—When in cold weather or through the use of hard water, the hands become chapped and fissured, a mixture of the compound tincture of benzoin and glycerin, equal parts, is of great service. The same preparation is advantageous in fissured nipples.

Abrasions, Chilblains, Wounds, Bedsores, and Granulating Surfaces.—Owing to its antiseptic virtues, its stimulating properties, and the fact that it protects the parts over which it is painted with a thin film, the compound tincture, painted over any of the above local disorders, is productive of much good.

Eczema, Pityriasis, Urticaria, and Frost-bite.—The tincture of benzoin, 2 drachms; glycerin, 2 drachms; and rose-water, 4 ounces, used as a lotion may be applied with advantage to either of the above skin disorders. In frost-bite, however, the compound tincture, applied locally, is more effective.

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Tincture of benzoin useful in scabies. In two cases the itching ceased, and the eruptions began to disappear after the first application and the patients were finally cured. Vladimir de Holstein (Jour. des Mal. Cutan. et Syph., Apr., '97).

Liquid benzoin for benzoinating lard may be made by macerating for twelve hours benzoin, 20, in ether, 40; it is filtered and castor-oil, 15, is dissolved in the filtrate, from which the ether is carefully distilled. This oily product contains the benzoic acid and the volatile principles. To make benzoinated lard, white wax, 20, is melted by steam heat with dehydrated lard, 965, to eliminate water; the above liquid, 15, is added and the mixture stirred until cold. In warm weather a large amount of wax should be used. R. M. Shoemaker (Amer. Jour. of Pharmacy, No. 1, p. 9, '98).

BENZONAPHTHOL. See NAPHTHOLS.

BERIBERI.—Jap., *kakké.* It has been suggested that the term is from *bhér-bheri*, a Hindoo word meaning a sore or swelling; or from *b'here*, a sheep, from the fancied resemblance between the gait of sufferers from this disease and the jerky movements of sheep; or from the Cingalese word *beri-beri*, meaning "great weakness." The latter etymology is almost surely the correct one.

Definition.—A probably specific endocpidemic disease characterized by multiple peripheral neuritis, in which there is numbness and stiffness of the limbs, paralysis of the extremities, pain and

tenderness on pressure, paræsthesiæ, and abolition of the tendon reflexes, together with frequent anasarca, cardiac irregularity, and gastro-intestinal disorder, often terminating in death.

Symptoms.—Two forms of beriberi are met with: the œdematous, sometimes termed the "wet" form, and the paralytic, or "dry" variety. The œdematous form is characterized by general anasarca with the appearance of great anæmia. It usually begins with fever, which may be slight and intermittent. Œdema of the extremities then sets in, beginning usually over the dorsum of the foot and extending upward. As the serous effusion into the subcutaneous cellular tissue takes place, puffiness and numbness follow. A peculiar localized thickening of the tissues, or "solid œdema," is sometimes observed over the shin and in the thighs and chest. With the beginning œdema, cardiac symptoms are usually observed, this fact having caused some authors to attribute the effusions to the venous stasis resulting from dilatation of the right ventricle. The heart's action is irregular, rapid, palpitating, and frequent, the systole being somewhat increased in force and louder at the apex. Loud blowing murmurs, resembling the *bruit de diable* of exophthalmic goitre, with violent pulsation of the blood-vessels in the neck are present, as a rule.

In a great number of cases of beriberi the first heart-sound is observed to be so prolonged as to be considered by some authors as a sanguineous murmur. Besides this systolic murmur, there is often violent palpitation due to myocarditis, which may cause death, as does paralysis of the heart, from alterations of pneumogastric, recurrent, and vasomotor nerves, found in the disease. Albert Ashmead (Inter. Med. Jour., '93).

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Study of the modification of electrical reactions, showing relationship between the acceleration of the pulse and the diminution of galvanic excitability, though not in all cases. Glogner (Virchow's Archiv, B. 132, p. 50).

The respiration is embarrassed, and præcordial pains are frequent.

As regards the digestive system, the tongue is usually pale and flabby. The appetite, normal at first, gradually becomes impaired; disorders of digestion are frequent and are occasionally accompanied by hæmatemesis. Constipation is almost the rule. The urine is usually high-colored and scanty, and contains no albumin, unless a concomitant affection be present.

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The pale, blanched, and anæmic-looking cutaneous surface does *not* indicate true anæmia, since examination of the blood shows percentage of hæmoglobin slightly, if at all, lower than normal. E. D. Bondurant (N. Y. Med. Jour., Nov. 20, '97).

In the so-called "dry" form the nervous symptoms, which are also present in the œdematous cases, are most prominent. Pain, of a stinging, burning, and most distressing character, is frequent. Anæsthesia to touch and paræsthesia, the latter being represented by pricking, formication, and tingling (the *piri-piri* of the Japanese), are prominent symptoms, paresis of the extremities accompanying. Cramps are sometimes complained of. The knee-jerk is absent in almost every case, while paralysis of the diaphragm is not infrequent, this complication giving rise to dyspnœa.

Paralysis of the diaphragm is not uncommon in severe cases. Coughing is thus rendered very difficult, and dyspnœa is not uncommon: anæsthesia and

paræsthesia are frequent, beginning, as a rule, in the region of the peroneal nerve. Miura (Virchow's Archiv, B. 123, H. 2).

The motor symptoms are usually well-marked, and the gait of the patient is characterized by wobbly, inco-ordinate, and jerky movements, due to dropping and inversion of the foot. In advanced cases the power of locomotion may be entirely lost. In cases in which the morbid changes have an extensive distribution, the patient may be unable to move. The upper extremities are always involved in severe cases.

tion of the joints. The relaxation of the ankle- and knee- joints is extreme in some cases, and is present probably in all. In many this condition permits the legs and feet to be placed in postures resembling those occurring in subluxations of the knee or ankle. This condition gives rise to a characteristic wobbling at the knee in walking, which the Japanese designate, according to Professor Anderson, by the term *gaku-gaku*. Editorial (Brit. Med. Jour., Aug. 14, '97).

Cases of beriberi, late stage, showing atrophy of muscles of legs and foot-drop. (*Bondurant.*)

Muscular atrophy may be a more or less prominent late feature of the case, that of the inferior extremities being the most pronounced. The joints are greatly relaxed, and foot-drop and wrist-drop are typically shown in the annexed cuts. In severe cases there may be contracture.

Electrical examination shows the reaction of degeneration, even in acute cases.

In the acute form, the symptoms outlined follow in quick succession, and death is exceedingly frequent. This is frequently mentioned as the "pernicious" form of beriberi.

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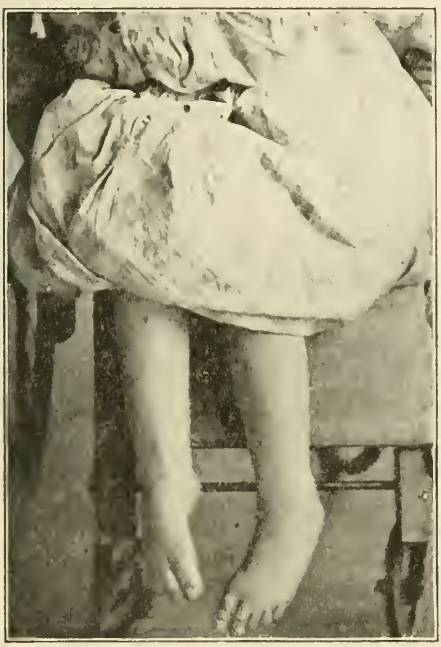
Special attention has been given in the Richmond Asylum to the condi-

Disease divided into three forms: 1. Acute, with pyrexia, anæmia, anascara, serous effusions, paralysis, and dysp-

nœa. 2. Subacute, with pain, atrophic paralysis, anæsthesia, loss of knee-jerk, mental debility, and œdema. 3. Chronic, with prostration, anæmia, œdema, and cardiac dilatation. Thomas (Edinburgh Med. Jour., Jan., '90).

Two characteristics not yet noticed: patients are subject to attacks of perspiration, ordinarily limited to the head, but sometimes general. In addition, two exceedingly sensitive points are to be found on the feet: one toward the middle of the dorsal face of the first in-



Case of beriberi, early stage, showing paralysis and foot-drop. (*Bondurant.*)

termetatarsal space, corresponding to the bifurcation of the internal branch of the anterior tibial nerve; the other at the cuboid protuberance, corresponding to the external saphenous nerve. Previous to any treatment the patient should be withdrawn from the endemic surroundings. C. E. Corlette (Brit. Med. Jour., Sept. 28, '94).

Case of suddenly-developing beriberi,—œdematous paralysis with blindness. The patient suffered from optic neuritis with central scotoma and consequent blindness. The urine exhibited a sensible diminution of urea and an almost parallel decrease of other constituents. There was a decrease of the red blood-corpuscles and an increase of the leucocytes. In several muscles a partial reaction of degeneration was obtained, notwithstanding the return of voluntary motion. Mossé (Med. Bull., Jan., '95).

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Series of seventy-one cases which, during 1895-'96, occurred among the patients in the State Insane Hospital, at Tuscaloosa, Ala. A striking feature of the disease was its variability in mode of onset. Some cases began suddenly with fever and gastro-intestinal irritation, as is commonly seen in the acute infections, the local neuritic symptoms appearing either simultaneously or after a few days. In other instances the onset was insidious, the initial vague aches, pains, and discomfort gradually crystallizing into the clinical picture of neuritis without fever or general systemic disorder, it being in many of these cases impossible to date the commencement of the attack. In still other cases the initial symptom was suddenly occurring dyspnœa, with tachycardia and violent pulsation of the vessels of the neck; œdema of feet and ankles was, in others, the first indication.

The temperature was, in about half of the cases, elevated in the beginning, but usually subsided to normal within a week or less.

The clinical manifestations of inflammation of the peripheral nerves varied in intensity, distribution, and character, but always consisted in weakness, perversion, or abolition of function of the affected nerve-trunk. In all cases the disease began in the nerves of the legs.

The sensory symptoms were frequently those to first attract attention: pain and tenderness in the area of distribution of the affected nerve, at first aching and not very severe, but becoming progressively more intense, and at its height very distressing.

The motor symptoms, appearing with or shortly after the sensory disorders,

were: stiffness in muscles supplied by affected nerves, progressing through simple weakness and disinclination to exertion to some degree of paralysis, this, in severe cases, becoming complete.

Vasomotor and trophic disorders, other than the œdema in affected parts, which is referred to below, were not frequent.

Almost without exception the portions of the body supplied by affected nerves grew œdematous.

The chief and earliest symptom of heart-implication is rapidity of action, with weakness. This begins about or shortly after the time the nerves of the body and arms become attacked.

The rapidity of heart-action in these cases will average about 130, but may show a higher rate. In one extreme case the pulse for three weeks ranged between 180 and 210, the patient suffering surprisingly little dyspnœa. E. D. Bondurant (N. Y. Med. Jour., Nov. 20, '97).

Diagnosis. — Beriberi prevails endemically in tropical and subtropical countries, especially in Brazil, the West Indies, India, and Ceylon. That it also occurs occasionally in temperate climates has recently been shown by the outbreaks at the Richmond Asylum, in Dublin, and the Insane Hospital at Tuscaloosa, Alabama. Its peculiar characters readily cause it to be recognized, and the diseases with which it can be confounded are few.

Malignant Dropsy.—This affection is less infectious and attacks exclusively the insane. Paralysis is never observed. The digestive tract is unaffected. The progress is slow, and in an epidemic very few persons are affected, differing in these respects from beriberi. (Melendez.)

Ceylon Anæmia.—This affection, due to the presence in the intestines of the *Anchylostoma duodenale*, is also characterized by weakness and numbness; but there are no true motor symptoms, and intestinal hæmorrhage is frequent (Kynsey). The anchylostomum is sometimes found in beriberi, and the two affections are considered as similar by some authors.

Two cases of beriberi associated with *Distoma crassum*, *Anchylostoma duodenale*, and other parasites. James Walker (Brit. Med. Jour., Dec. 5, '91).

Anchylostomum duodenale, a human parasite found in tropical countries, and especially in Ceylon, gives rise to grave anæmia, often ending in death. This affection, the kala-azar, or beriberi, of Ceylon, bears no resemblance to the true beriberi, except a cachexia, often accompanied by muscular weakness and dropsy. Giles (Indian Med. Record, July, '90).

Beriberi and the kala-azar of Assam are identical: the latter an anchylostomiasis caused by the *Dochmius duodenalis*. Giles (N. Y. Med. Jour., Mar. 26, '92).

Beriberi a peripheral neuritis, independent of the presence of anchylostoma; the affection produced by the latter is absolutely distinct from beriberi. Leslie (Brit. Med. Jour., Feb. 27, '92).

Anchylostomiasis is common in countries (such as Italy) where beriberi is not found. *Anchylostomum filaria sanguinis* or *Trichocephalus dispar* may be present in beriberi; but they are co-incidents, and not a cause. Anchylostomiasis has symptoms not at all like beriberi. Giles (Indian Med. Rec., July, '90).

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In beriberi (endemic neuritis) we must look for the characteristic cardiac and nerve symptoms and the reaction of degeneration.

In anchylostomiasis (parasitic anæmia) we must search for the worm after the exhibition of thymol, or by microscopical examination of a portion of the excreta for the ova of the parasite.

In kala-azar (epidemic malarial fever), which is confined to Assam, we have the history of the sure and slow spread and evidence of its infectiveness.

The co-existence of malarial cachexia with either beriberi or anchylostomiasis, as very frequently happens in tropical

countries, renders an exact diagnosis sometimes difficult, and it is this fact which, in countries where malaria is very common, has stood so much in the way of clear ideas on the above diseases. W. J. Buchanan (Dublin Jour. Med. Sciences, Dec., '97).

An epidemic of peripheral neuritis is probably one of beriberi. When, in the beginning, the symptoms are indistinct, the subsequent rapid development of œdema and paresis, in the absence of any other cause—*e.g.*, nephritis—points to that disease.

Malarial neuritis of a character simulating beriberi is exceedingly rare. It is generally confined to one nerve; besides, paresis, muscular atrophy, and cardiac disturbances are absent. If the plasmodium of Laveran is found and the disease responds to quinine, the diagnosis is cleared up; both diseases may co-exist.

In alcoholic neuritis we have, besides a history of drinking, gastric catarrh and mental disturbances. Œdema is infrequent in uncomplicated cases. It is possible, however, for malaria, beriberi, and alcoholic neuritis to be present in the same patient.

In lathyrism, due to the poison of the *Lathyrus sativus*, there is no œdema, anæsthesia, or cardiac disturbance.

In trichinosis the pain is principally in the muscles of the trunk, head, and neck. Violent gastro-intestinal paroxysms precede the muscular pain. Cardiac trouble and paresis are absent. O. D. Norton (Indian Lancet, June 16, '98).

Etiology.—Until recently a great diversity of opinion has existed regarding the cause of this affection. The researches of Pekelharing and Winkler have increased the probability that beriberi is caused by the presence, in food and infected habitations or ships, of a specific micro-organism.

Beriberi has no dependence on anæmia. There exists a well-developed and recognizable initial stage for all forms of the malady. The unity of the various clinical and frequently widely-differing forms of beriberi is confirmed by a close investigation into the electrical reaction of nerve- and muscle- tissue. The majority of the symptoms are dependent on affections of nerve- and muscle- tissue, and these are due to a definite nerve-degeneration.

In the blood of beriberi patients bacilli and micrococci are to be found. Pure cultures of these micrococci give a nerve-degeneration of like nature to that found in beriberi when injected into rabbits and dogs. The inhalation of air impregnated with such culture can originate a nerve-degeneration in rabbits. Beriberi must, in all probability, be regarded as a contagious disease induced by the action of a micro-organism. The infecting micrococcus can also exist apart from contact with the human being.

Direct transmission from one person to another rarely occurs; infection through wearing-apparel is more common. The infecting material finds its way into the body principally through the respiratory organs. The spread of the malady can be interrupted by disinfection, or, in a person attacked, by removal; when the symptoms are once well developed nothing but nature can effect a cure. Pekelharing and Winkler (An Investigation into the Nature and Origin of Beriberi, and the Means to be Adopted for Counteracting the Disease, '88).

While the discovery of the specific micro-organism is yet to be verified, clinical evidence has shown that overcrowding, as in the case in ships, associated with defective and noxious ventilation and moisture and oftentimes insufficient or improper diet, tends to cause the development of the disease. By thus debilitating the system and rendering the latter amenable to the pathogenic effects of the germ, such untoward conditions of life might act as an indirect factor.

Whole crew affected in ship loaded with fermenting Manila hemp; also in another vessel loaded with fermenting cocoa-nut fibre. Ashmead (N. Y. Med. Rec., Nov. 24, '94; Univ. Med. Mag., Aug., '95; N. Y. Med. Rec., Oct. 5, '95).

Living in a confined atmosphere and in districts favorable to cryptogamic vegetation has considerable influence in the production of beriberi. Agapito de Veiga (Int. Med. Jour., Aug., '93).

Three cases in colored men who had worked in phosphate-beds. Probably caused by microbe of telluric origin, distinct from that of malaria. Dercum (Jour. of Nerv. and Mental Dis., Feb., '94).

Cases occurring in sailors, with symptoms closely resembling neuritis and akin to beriberi. The food was poor. Most of them were fisherman. Putnam (Jour. of Nerv. and Mental Dis., Aug., '90).

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In addition to bad ventilation and overcrowding, it is also recognized that insufficient diet encourages the development of the disease. But it should be borne in mind that these conditions foster, but do not generate, beriberi. The morbid entity which causes it must be imported into the locality in which the vicious environment prevails, an environment which is eminently favorable to the development of many other epidemic diseases. Editorial (Lancet, Aug. 14, '97).

Regarding the epidemic at the Richmond Asylum, Dublin: "Not only is the whole institution overcrowded far beyond its normal accommodation, but even the new wooden building for males is not fit to contain more than half the number at present occupying it. Its two dormitories are at present occupied by 100 patients, although not suited to give sanitary accommodation to more than 50. The women's permanent hospital contains as many as 63 patients, who have an average of 451.968 cubic feet of space each." This space ought properly to suffice for the accommodation of 25 patients. Sir Thornley Stoker (Boston Med. and Surg. Jour., Aug. 12, '97).

In the seventy-one cases which occurred in the Insane Hospital at Tuscaloosa, Ala., the first case developed in February, 1895. The disease was not again seen until November, 1895, when almost simultaneously seven cases developed among the white female patients. During the succeeding six weeks five cases made their appearance, all of similar type. After a period of immunity the disease reappeared in the late summer of 1896, when, following a season of unusual dryness and distressing heat, fifty-eight patients were attacked. Statement giving the average population of the hospital during the period covered by the outbreak:—

	WHITE.		NEGRO.		Total.
	Men.	Women.	Men.	Women.	
Approximate number of patients in hospital	460	435	140	165	1200
Number of cases of beriberi	43	21	6	1	71
Fatal cases of beriberi	11	4	5	1	21
Number of epileptics in hospital	45	15	15	5	80
Number of cases of beriberi in epileptics	25	5	2	0	32

Peculiar distribution among the several classes of insane patients: every one of the seventy-one patients attacked was the subject of a psychical degenerative form of mental disorder. E. D. Bondurant (N. Y. Med. Jour., Nov. 20, '97).

The nature of the food, as shown in the results obtained by a change of diet in the Japanese navy, has an important bearing upon the development of the disease. The influence is but an indirect one, however, operating also by preparing the field for microbic infection, the latter only taking place when the person enters an infected abode.

Rapid spread in Brazil; rice the cause. Azevedo (Deutsche med. Zeit., Aug. 25, '90).

Rice-eating has weight in the etiology. Takaki (Sei-I-Kwai Med. Jour., Oct. 25, '90).

Success in controlling a considerable number of cases of beriberi in the Japanese navy, by adopting a food-regimen in which rice is, for the greater part, re-

placed by beef, pork, eggs, etc. Of 3063 cases per million in 1883, in 1889 there were only 388. Takaki (Brit. Med. Jour., Sept. 24, '92).

Three cases in which the cause of the disease seemed to be the use of old preserves, in which, however, the pathogenic agent was not to be found. Kirchberg (Gaz. Méd. de Nantes, Dec. 12, '93).

Ascribed to eating diseased tunny-fish. It was common in the Japanese navy until fish was abolished from the diet; vegetable-eating prisoners are also exempt. Miura (Virchow's Archiv, vol. cxix).

The aboriginal Aino, a great fish-eater, is very rarely attacked. Grimm (Deutsche med. Woch., Oct. 23, '90).

Cases in which microscopical and bacteriological examination showed blood to be free from any parasites. Disease probably due to toxæmia caused by ptomaines derived from special kinds of food. Judson Daland (N. Y. Med. Jour., Mar. 9, '95).

A toxæmia of alimentary origin (rice, fish); for cure, European rations indicated. Grall, Porcé, and Vincent (Revue Inter. de Méd. et de Chir., July 10, '95).

The disease due to abnormal fermentation in the intestines under certain circumstances, the ferment being, perhaps, a micro-organism. Owi (Sei-I-Kwai Med. Jour., Jan. 23, '92).

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The seventy-one cases at Tuscaloosa seemingly due to use of water contaminated by decaying vegetable matter. E. D. Bondurant (N. Y. Med. Jour., Nov. 20, '97).

In stamping out the disease in the Japanese navy, however, besides the improved dietary, very important hygienic improvements were introduced at the same time. D. C. Rees (Brit. Med. Jour., Sept. 18, '97).

Attention drawn to spread of this disease to suckling infants through the milk of nursing mothers suffering from it. Of 52 cases in such infants, 42 recovered and 5 died, the result in the remaining 5 cases being unknown. Cows' milk or condensed milk was mostly substituted for human milk. Improvement occurred almost at once. It is personally maintained that the disease is really due to an intoxication brought about by the milk, and that the only sure cure is to withhold the milk, and this before the disease is too advanced. Hirota (Centralb. f. innere Med., Apr. 23, '98).

Cold and damp have been regarded as etiological factors, the disease occurring

Negro paranoiac, of a degenerate type which seemed especially susceptible to the poison of beriberi. (*Bondurant.*)

most frequently on board of ships during the winter, probably owing to the fact that those exposed are more likely to remain huddled together in close quarters than during other seasons. The recent epidemics at the Richmond Asylum and at Tuscaloosa, Ala., however, occurred during the warm months, and the latter during a period of excessive dryness.

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Two epidemics of beriberi occurring on board ship, which appear to prove very conclusively that this disease is propagated through the drinking-water. In both cases the men were healthy as long as they still had a supply of European water, although staying for some time at places where the disease is endemic. But, the water having run short, they had, in the one case, to lay in fresh water at Batavia and, in the other, at Mauritius, in both of which places the disease occurs endemically. About four weeks after commencing to drink this water the disease broke out among the crew. It would thus, also, appear that the incubation period of beriberi is about one month. Roll (Norsk Mag. f. Laegevidenskaben, Nov., '95; May, '96).

At the Dakar prison in Senegal, western Africa, the total number of prisoners under observation in 1895 was 647, of whom 52 were Europeans, the remainder being natives. The two classes lived under identical conditions; whereas no European or mulatto contracted beriberi, there were 45 cases among the aborigines. Length of residence in the jail and want of occupation, together with overcrowding, defective ventilation, inadequate provisions for cleanliness, and the removal of filth were the chief determining causes. The affection generally commenced toward the third month of incarceration. Compulsory exercise was invariably followed by an amelioration of symptoms, but if the patient remained in prison a relapse ending fatally was sooner or later certain to supervene. Of twelve prisoners suffering from beriberi for whom pardon was asked in order that their lives might be saved, five were dead before the official intimation reached Dakar three months later. The seven survivors were at once set at lib-

Imbecile and paranoiac imbecile, illustrating types of degenerates most liable to beriberi. (*Bondurant.*)

erty, and eventually all of them recovered. Unhygienic conditions an important factor, but the chief cause of the disease is the lack of suitable employment. Lasnet (Archives de Méd. Navale et Coloniale, Feb., '97).

Marked predominance of the number of outbreaks that occur in the wet and cold months of the year, when, presumably, the native sailors will remain huddled up in their stuffy forecastle. Out of the 157 cases recorded, 96 occurred between October 1st and February 28th; the remaining 61 occurred between March 1st and September 30th. It has been shown that in a certain group of vessels, all drawing their food-supply presumably from the same source, in only one-half of their number did beriberi occur; and, further, that one epidemic undoubtedly renders a ship liable to future outbreaks.

The history of the outbreaks at the Richmond Asylum tends to prove that beriberi is a "place" disease and not a "food" disease. It is highly improbable that the same food-supply was used in this asylum during the epidemics of 1894, 1896, and 1897. With all these facts before us, we are justified in adhering to the belief that an outbreak of beriberi depends on "place" infection plus favorable predisposing conditions. D. C. Rees (Brit. Med. Jour., Sept. 18, '97).

Case of beriberi on top of Fujiyama, Japan, in the month of December, ascribed to insufficient alimentation and constipation. Miura (Sei-I-Kwai Med. Jour., June, '96).

Other factors in the etiology of the disease are fatigue, exhausting diseases, exposure to marked alternations of temperature, all conditions tending to sap the vital energies and reduce the nutrition of the nerve-centres, and to prepare the system for the attacks of the infectious principle.

Pathology.—Pekelharing and Winkler have obtained from the blood of beriberi patients a micrococcus which, inoculated in animals, produced polyneuritis. Ogata and Lacerda ascribe the disease to a bacillus resembling that of anthrax. Musso and Morelli have isolated four micro-organisms: a staphylococcus pyogenes albus; a micrococcus in chains; a small micrococcus; and, lastly, a small organism which, inoculated in dogs and guinea-pigs, produced a universal degenerative neuritis.

It cannot be said, however, that the specific organism of beriberi has been found. All that can now be admitted is that it infects asylums, barracks, prisons, the holds of ships, and other abodes where the hygienic surroundings are deficient.

The researches of Baelz and Scheube, in Japan, and those of Pekelharing and Winkler, in Java, have done much to elucidate the pathology of beriberi. The former ascribed to a multiple neuritis the symptoms of the disease, while the latter observers advanced and upheld with powerful evidence the view that the staphylococcus was the primary factor in its production. The disease is mainly one of the peripheral nervous system, which shows, in various regions remote from the cord and brain, more or less pronounced degeneration.

Results of fourteen autopsies. In the brain and spinal cord nothing abnormal found except the presence of vacuoles in the ganglion-cells of the spinal cord, a fact of little significance. In almost all of the cases there were cardiac hypertrophy and dilatation. The muscular tissue of the heart usually appeared normal, fatty degeneration was rare, but in two cases there were many granular cells in the interstitial tissue of the heart-muscle. There were no characteristic changes in the lungs. In a number of cases the kidneys showed alterations in structure, usually in the form of glomerulonephritis. The liver was usually of the nutmeg variety, and the spleen normal. The muscles very commonly showed the "waxy degeneration" described by Zenker and also a multi-

plication of the nuclei of the sarcolemma and an increase in the connective tissue. Miura (Virchow's Archiv, Feb., '88).

It is a multiple neuritis due to the action of a micro-organism. Gueit (Achives de Méd. Navale, Dec., '88).

The various bacteria discovered have no causal relation to the disease, and that its special seat is in the cord. Mendes (Deutsche med.-Zeit., Mar. 20, '90).

The disease is due to a micrococcus occupying the lumbar region of the cord. Production of the disease by inoculating animals with cultures of these micrococci. Rebourgeon (La Semaine Méd., July 23, '90).

It is a mixed infection whose agents are not easy to discover; the disease is not due to a primary degenerative neuritis. Fiebig (Schmidt's Jahrbucher, Sept. 15, '90).

Presence of dochmiasis (anchylostomiasis) in Austria, particularly in the mining region of Bremberg. Julius Zappert (Wiener klin. Woch., June 16, '92).

Beriberi produced by some micro-organism. In one hundred cases only once was a kind of filaria found in the blood. Anchylostoma only met with eight times. Sinclair (London Lancet, Dec. 26, '91).

North Brazil as the father-land of the disease, from which it has been spread by commercial intercourse with other nations. Two forms: the œdematous and the paralytic. Four forms of bacteria. W. Leopold (Berliner klin. Woch., No. 4, '92).

Four micro-organisms were isolated, as follows: (1) staphylococcus pyogenes albus; (2) micrococci in chains; (3) a small streptococcus, colorless, of unknown character and difficult cultivation; and (4) a micrococcus which, by inoculation in guinea-pigs and dogs, causes a degenerative neuritis, and is described as the micrococcus of beriberi. Musso and Morelli (Berliner klin. Woch., Jan. 25, '93).

Beriberi due to a bacillus cultivated from rice; the same found in the blood of rats that had died after eating the rice. De Lacerda (Bentley: "Beriberi"; Scheube: "Die Beriberi-Krankheit").

Organism sought in the blood of patients while alive. Numerous micro-organisms—cocci and rods—found.

Inoculative experience leading to the conclusion that a white micrococcus cultivated from the blood is the cause of beriberi. These white cocci impregnate the air of the infected houses, ships, and districts, get into the human circulation through the air-passages, and when they are absorbed in sufficient amount—some weeks' exposure to the infection being necessary—produce in the blood toxins in such quantity and of such a nature as to bring about a parenchymatous degeneration of the peripheral nerves. Pekelharing and Winkler ("Beriberi," Edinburgh, '93).

Pekelharing and Winkler did not produce beriberi in the animals injected; the cocci found by them are not the cause and not even one of the causes of the disease. Beriberi cannot probably be produced by several organisms, as suggested. The cause of beriberi has not yet been ascertained. Scheube ("Die Beriberi-Krankheit," '94).

Bacillus, found in the spinal cord of a patient who had died from beriberi, resembling the anthrax bacillus. Cultures injected in mice and dogs caused the development of the symptoms of beriberi. This bacillus being found in the intestines of patients, conclusion reached that it was the toxins of these bacilli being absorbed into the circulation that caused the paralytic symptoms. Ogata (Bentley: "Beriberi"; Scheube: "Die Beriberi-Krankheit," '95).

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A micrococcus cultivated from the blood and ascitic fluid of two cases of beriberi, which, when injected into rabbits, produced symptoms of beriberi. Musso and Morelli (Sternberg's "Bacteriology," '96).

Cocci cultivated from the blood of beriberi patients; by inoculating rabbits with the growth the symptoms of that disease produced. De Lacerda (Sternberg's "Bacteriology," p. 473, '96).

Four varieties of organisms cultivated from the blood of beriberi patients, as follows: (1) micrococcus albus: a micrococcus which was immobile, aërobic, and which liquefied gelatin; (2) micrococcus tetragonum flavus: cocci arranged in tetrad forms; (3) micrococcus flavus: also aërobic and liquefying gelatin; and (4) bacillus flavus: short rods in pairs and chains, in active motion, aërobic, and with spore-formation. On injecting animals with these growths, three of them—the first, third, and fourth—each produced paralysis. No result was obtained with micrococcus tatragonum flavus. Van Eecke (Scheube: "Die Beriberi-Krankheit," '97). The above nine abstracts quoted from an article by W. K. Hunter (Lancet, July 31, '97).

In spite of the arduous researches of Pekelharing, Winkler, and others the organism which is the cause of beriberi has not been satisfactorily or certainly determined. Spencer (Lancet, Jan. 2, '97).

Study of two cases, including inoculation experiments, tending strongly to show that the staphylococcus of Pekelharing and Winkler is the specific microorganism of beriberi.

Although Fiebig has argued that it has the same characters as staphylococcus pyogenes albus, and that it is the same organism, the pathogenic characters of the two are very different. The staphylococcus pyogenes albus injected into the abdominal cavity of a rabbit would produce septic results. In not one of six rabbits did an abscess form at the seat of inoculation, and in not one was any inflammatory condition of the peritoneum to be made out. W. K. Hunter (Lancet, July 31, '97).

Two cases of beriberi, in both of which specimens of freshly-drawn blood showed micro-organisms in rapid motion in the spaces between the groups of corpuscles. Of 30 tubes of culture-media (agar-agar and bouillon-tubes) that were inoculated with the blood 3 growths were obtained from one case and 1 from the other. These presented all characters of staphylococcus of beriberi. Three of the cases were pure and one a mixed infection. Pathogenic properties of the staphylococci found were determined by injecting rabbits.

There were no macroscopical post-mortem lesions. The nerves, however, showed microscopically unmistakable parenchymatous degeneration. W. K. Hunter (Lancet, June 25, '98).

When the disease has advanced, the various organs are infiltrated with serous fluid, and the tissues, especially the muscular, undergo degeneration. The heart is enlarged, and the kidneys also present marked evidence of degeneration.

Histological examination; conclusion that the disease is an infectious lesion rapidly destroying the epithelium of the kidneys, liver, and muscles, particularly the cardiac fibres, by granulo-fatty degeneration; it causes the production of masses of new cells in the connective tissue of the liver, spleen, kidneys, spinal marrow, and brain and certain nerves, the vagus in particular. Nepveu (Marseille-médical, June 15, '94).

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Series of seventy-one cases which, during 1895-'96, occurred among the patients in the State Insane Hospital at Tuscaloosa, Ala. Of the 21 fatal cases, 1 patient died of pulmonary tuberculosis, 1 of pneumonia, 2 in the *status epilepticus*, 14 directly from heart-failure, and the remaining 3 from a combination of causes. The complications hastened or insured a fatal termination in 6 or 7 cases. E. D. Bondurant (N. Y. Med. Jour., Nov. 20, '97).

In general, it may be said that the nearer the equator, the more numerous the hydropic forms and the greater the mortality. The mortality is always high when the patients continue to live under the same conditions and in the same place as that in which the disease was contracted. The lethal complications are respiratory and cardiac failure and bronchitis. O. D. Norton (Indian Lancet, June 16, '98).

Prognosis.—The mortality of beriberi varies considerably in different epi-

demics, and may range from 8 to 44 per cent. On shipboard the number of deaths may surpass that proportion.

Beriberi may cause death in three ways, these being, in the order of frequency, by failure of the heart from peripheral paralysis of its special nerves; by suffocation from congestion and œdema of the lungs; by effusion into the pericardium. (Max Simon.)

A peculiarity of this disease is its tendency to relapse, and the fact that with each relapse the prognosis becomes much more unfavorable.

Treatment.—The first step should naturally be to remove the patient from the unhygienic surroundings in which he may find himself, and especially from germ-infected abode. Out-of-door life and suitable diet are the primary elements of cure.

As to remedial measures, the symptoms should be treated as they occur, there being no specific remedy at our disposal. The œdema should be met with acetate of potassium, squill, and digitalis. Cathartics may be administered to antagonize the constipation, opium to arrest the pain, and camphor, digitalis, and strophanthus be given when cardiac symptoms appear. Diaphoretics and hot vapor-baths are useful in the œdematous form, unless they debilitate the patient. When there is marked dyspnœa ether, hypodermically, is of great service. Methylene-blue, 3 grains two or three times a day, was found very valuable by Thur, and salicylate of soda by Berry, of Boston. When the case is beginning to improve, electricity, judiciously employed, may prove of great benefit to stimulate the vasomotor system and increase the nutrition of the muscles. Massage also is valuable.

Strychnia, in gradually increasing doses until slight toxic phenomena are produced, is capable of bringing about a cure even when the paralysis is complete. The treatment is begun with $^1/_{60}$ grain, and the same quantity is added every third day until $^1/_6$ grain is taken. If the disease should return, the initial dose of $^1/_{60}$ grain should again begin the course of treatment. (Domingos Freire.)

E. D. Bondurant,
Mobile.

BETANAPHTHOL. See Naphthols.

BICARBONATE OF POTASSIUM. See Potassium.

BICARBONATE OF SODIUM. See Sodium.

BICHLORIDE OF MERCURY. See Mercury.

BISMUTH.—Bismuthum is a whitish-gray, hard, though brittle, metal, with melting-point at 286.3° C. It is soluble in nitrohydrochloric, nitric, and hot sulphur acids.

It is very commonly contaminated with lead, iron, and copper, together with traces of arsenic, antimony, and tellurium.

In the metallic form bismuth is not used in medicine, but its salts, particularly if free from contamination, are of great value.

The garlicky odor sometimes produced in the breath of patients taking the salts of bismuth is due to the presence of the metal tellurium. This fact was first noticed by Sir James Simpson, and was established further in 1875, when specimens of bismuth containing tellurium as an impurity invariably produced in the breath the peculiar odor referred to.

The salts of bismuth are numerous, but only the most efficient will be mentioned, together with dosage.

Dose.—The subcarbonate is a white, tasteless powder soluble in dilute nitric acid with effervescence. Dose, 5 to 20 grains.

The subnitrate occurs as a white microcrystalline powder soluble in acids. Dose, 5 to 20 grains.

Bismuth citrate is a white amorphous powder, odorless and tasteless, and soluble in solutions of the alkali citrates. Dose, 1 to 5 grains.

The benzoate is a white, tasteless powder soluble in mineral acids. It contains 27 per cent. of benzoic acid. Dose, 5 to 15 grains.

Bismuth betanaphtholate occurs as a light-brown, insoluble, odorless powder. Dose, 15 to 30 grains.

The salicylate of bismuth is a white, bulky microcrystalline powder soluble in acids and alkalies. Dose, 5 to 20 grains.

The subgallate is well known under the name of dermatol (*q. v.*). It is without odor, non-irritant, and non-poisonous. Dose, 5 to 20 grains.

Physiological Action.—When applied to excoriated or ulcerated surfaces the salts of bismuth, for the most part, exert an astringent and sedative action. The claims that some of the salts of bismuth possess antiseptic properties—the organic compounds—have been substantiated by experimentation and practical observation,—salicylate, benzoate, and betanaphtholate.

> Contrary to the observations of Morax and von Pfungen, bismuth in large doses possesses the property of decreasing notably the amount of sulphuric acid in combination among those subjects whose food consisted chiefly of albuminoid substances; indican is decreased and at times it disappears. The action of bismuth is poorly understood; these facts show that intestinal putrefactions diminish decidedly, despite that checking of intestinal peristalsis which bismuth effects. Devoto (Semaine Méd., No. 54, '94).

Literature of '96-'97-'98.

> Bismuth naphtholate (bismuth oxide, 80 per cent., and betanaphthol, 20 per cent.) decidedly antiseptic. The drug is partly decomposed in the stomach, but the process is completed in the small intestine. R. W. Wilcox (Med. News, July 31, '97).

The action of the salts of bismuth when taken internally in therapeutic doses is much the same as when applied locally.

> The salicylate of bismuth causes a slight increase in the elimination of sulphuric ether by the urine. This elimination is somewhat diminished two or three days after the administration of the drug. Rovighi (Monat. f. prakt. Wasserheil., p. 372, '93).

The subnitrate is a powerful bactericide. It is to this action that it owes those virtues which have been for a long time universally appreciated in gastro-intestinal diseases that are the result of morbid fermentation, and in urethritis. It also owes its efficaciousness to the inpendent action of its oxide and its acid. The oxide has the property of saturating the acid supersecretions of the stomach; the acid has the same qualities and undergoes slow chemical changes in the intestine. From the time it comes in contact with these digestive regions the subnitrate meets with hydrosulphurous emanations, which, although transforming it into the black sulphide, set a corresponding proportion of nitric acid free. Because of its own acidity, the nitric acid acts directly on the intestinal mucous membrane as an astringent; but to this topical action its special antiseptic

virtues may be added, for, according to Duclaux, the presence of a trace of nitric acid in an organic solution arrests the evolution of a great number of microbes and hastens their destruction. Meanwhile its bactericidal action does not cease here; from the time that it comes in contact in its intestinal course with fresh hydrosulphurous vapors it is reduced and transformed into nitrous vapors, the special antiseptic action of which, in regard to the bacteria which secrete putrid gases, has been shown by Girard and Pabst.

Bismuth subnitrate, in doses of 1½ to 2 drachms, lowers the ratio of sulphuric-acid compounds in patients living principally on albuminoid diet. At the same time indican diminishes or entirely disappears from the urine. This shows that putrid fermentation going on in the intestine diminishes, in spite of the fact that, under the influence of bismuth, intestinal peristalsis has been suppressed. Devoto (Rev. Inter. de Thér. et Phar., Nov. 15, '95).

Literature of '96-'97-'98.

The use of the organic in place of the inorganic bismuth should be insisted on. The compounds of bismuth with beta-naphthol, phenol, tribromphenol, and tetraiodophenolphthalein are remedies which produce practical intestinal antisepsis. They are indicated in all gastro-intestinal fermentations and catarrhs until the symptoms are relieved, the dose to be determined by the severity of the symptoms. They are non-toxic and do not give rise to untoward symptoms. Wilcox (Med. News, July 31, '97).

Bismuth is poisonous when introduced under the skin. It should not, therefore, be employed subcutaneously under any circumstance.

Poisoning.—Poisoning may occur either from local application of bismuth preparations, from internal administration, or from subcutaneous injection.

A number of cases of poisoning recorded, produced by the absorption of insoluble preparations of bismuth when used as surgical applications, in which there was acute stomatitis, a blackened, ulcerated mucous membrane, followed by intestinal catarrh with pain and diarrhœa, and in severe cases by a true nephritis. Kocher (Volkmann's Samm. klin. Vort., No. 224, '87); Petersen (Deutsche med. Woch., June 30, '87).

Case of poisoning by bismuth. A young woman had a large burn on the back, which was powdered with subnitrate of bismuth. A dark line appeared on the lips, with headache, nausea, vomiting, fever, and quick pulse, and the urine contained a small quantity of albumin. Neither lead nor arsenic was found by analysis in the bismuth employed. N. L. Wilson (N. Y. Med. Jour., Jan. 20, '94).

In the early studies of bismuth the effects of acute poisoning by the subnitrate of bismuth were alone observed. More recently, however, injecting into dogs repeated doses of the compound at intervals of several days or hours has given results closely allied to those observed in the human being by Kocher and Petersen, save that death followed in the train of these signs, which were, by reason of the large-size dose, very severe. Ulcerations replaced the aphthous patches, the liver was found congested, and the coats of the large intestine blackened. These changes come on in strong, healthy dogs weighing from fourteen and one-half to fifteen kilogrammes (twenty-nine to thirty-five pounds). (Dalché and Villejean.)

The distinction which is to be drawn between a stomatitis resulting from the prolonged use of bismuth, and that which is commonly seen after continued doses of mercury, consists in a lesser degree of ptyalism. While the color of the spot usually becomes black if caused by

bismuth, it seldom becomes so dark in hue under the influence of mercury. The changes in the vascular system, which are caused by bismuth in chronic poisoning, consist in the dilatation of the blood-vessels, with consequent relaxation and congestion of the part.

Literature of '96-'97-'98.

Case of a patient who had been attacked three times by a scarlatiniform erythema, followed by desquamation in patches, in consequence of having taken 30 grains of bismuth subnitrate that had been prescribed after an attack of diarrhœa. Amédée Dubreuihl (Bull Gén. de Thér., p. 229, '97).

Twins, 3 weeks old, given Squibb's subnitrate of bismuth in the dose of 7½ grains every two hours, increased to 15 grains each every two hours. Soon the bismuth passed from the bowels uncolored. The breath took a strong, garlicky odor, so much so that the mother remarked about the peculiar odor. The infants then slowly changed to a dark color, as if asphyxiated. Infants sleepy. Drug almost wholly withdrawn; the cyanosis disappeared from both children as rapidly as it had come. A. S. Maxson (Annals of Gynec. and Ped., July, '97).

Treatment of Poisoning.—The stomach should be evacuated and the freshly-prepared sesquioxide of iron administered as the antidote to arsenic which is commonly combined with the native bismuth.

Demulcents should be freely exhibited, and stimulants as the case may require. Following the administration of the soluble salts of bismuth accumulation in the liver may occur; but this is not likely to follow the use of the insoluble preparations.

Therapeutics.

Locally.—Many of the bismuth salts are useful when applied locally. The subnitrate of bismuth is a neglected remedy for external use. It has been found very useful in acute and chronic moist eczemas, as well as in intertrigo and excoriations in the region of the anus and genitalia in children. In fissured nipples, herpes zoster, ulcers, and in affections of the mucous membranes it has also proved serviceable.

Of the many bismuth preparations, but one may be substituted for iodoform, —namely, bismuth salicylate.

In the first period of the chancroid and in tubercular ulcerations of the skin, if the salicylate of bismuth is dusted once a day on the diseased area, after a few applications the granulations become florid and the lesions show a marked tendency toward cicatrization. As soon as the granulations appear healthy the salicylate of bismuth is better applied mixed with subnitrate or subgallate of bismuth (1 to 2), which mixture is generally sufficient to cause the complete cicatrization of the ulcer. R. Brindisi (Ther. Gaz., Mar. 15, '95).

Dyspepsia.—Many of the bismuth preparations have decided value in the treatment of gastro-intestinal disorders.

Literature of '96-'97-'98.

Bismuth tribromophenolate useful in cases of gastric fermentation. Toxic symptoms never observed, although administered in doses ranging from 90 to 120 grains daily. Harmlessness attributed to a slow decomposition and the setting free of phenol. R. W. Wilcox (Med. News, July 31, '97).

Dyspepsia attended with hyperacidity, irritable stomach, and gastric carcinoma are often happily influenced by the administration of bismuth.

For such the following may be used:—

℞ Subnitrate of bismuth,
Carbonate of magnesia, of each, 5 grains.
Morphine sulphate, $^1/_{12}$ grain.
M. For one powder.

Gastric Ulcer.—This disorder is benefited by 10- or 15- grain doses of the subnitrate or benzoate three or four times daily. The addition of a small quantity of morphine markedly increases the analgesic action.

Chloroform-water with bismuth (water, 150; bismuth, 3; chloroform, 1) very valuable in chronic gastric ulcer. Its beneficial effects are due to its antiseptic, astringent, and hæmostatic properties. It also exerts a stimulant effect locally, healing the ulcer. Stepp (Ther. Monats., Nov., '93).

Fleiner's method of treating irritative diseases of the stomach with large doses of bismuth very successful, especially in lessening pain. Massive doses are of use especially in gastric ulcer. Matthes (Centralb. f. klin. Med., Jan. 6, '94).

Literature of '96-'97-'98.

In cases of gastric ulcer excellent results obtained by giving large doses of bismuth by the mouth in cases where the ordinary doses had not proved successful. Doses of 30 to 40 or even 50 grains of bismuth subnitrate were given three times a day suspended in water. Under these pain was rapidly relieved, vomiting ceased, digestion improved, allowing light nitrogenous food, such as fish or fowl, to be given, and the ulcer quickly healed. In acid dyspepsia it rapidly relieved the symptoms. In neurasthenic conditions, with symptoms resembling those of gastric ulcer, it also was of great service. Two cases of gastric ulcer, which were not relieved by large doses of bismuth given by the mouth, were cured by injecting the bismuth into the stomach after lavage. Dreschfeld (Brit. Med. Jour., Mar. 12, '98).

Diarrhœa.—Acute or chronic diarrhœas are often relieved by bismuth.

A dose of castor-oil in advance of bismuth subnitrate is of value in removing any possible cause of irritation. (Ringer.)

In severe diarrhœa in children it is best never to commence with a dose of less than 5 or 8 grains, and it is possible to dispense entirely with opium in many instances. Its beneficial action is undoubtedly due as much to the antiseptic power of the salicylic acid as to the astringent property of the bismuth. (Hale.)

It can best be administered to children in a mixture with glycerin and water, to be shaken before taken. The form of powder should be avoided, as liable to produce irritation of the gastro-intestinal mucous membrane. (Ehring.)

Naphthol is the remedy most frequently employed to procure intestinal antisepsis, but the burning taste sometimes renders its use impossible, particularly in children, and it is customary to combine it with a bismuth salt. Much more advantageous to use instead naphtholate of bismuth, or betanaphthol-bismuth, which decomposes in the intestine into naphthol and bismuth. Chaumier (Rev. Gén. de Clin. et de Thér., Sept. 21, '95).

Literature of '96-'97-'98.

In a very severe case of intestinal putrefaction bismuth naphtholate found to give great relief, limiting the tympanites, removing the offensive odor, and improving nutrition. R. W. Wilcox (Med. News, July 31, '97).

Typhoid Fever.—Bismuth betanaphtholate is a very efficient agent in the diarrhœa of this disease, especially in intestinal hæmorrhage, giving the drug freely by the mouth as soon as the first bloody stool is observed. From 2½ to 3 ounces may be administered in twenty-four hours, in doses of 2½ drachms either in lactic-acid lemonade, diluted milk, or cachets; 1 ounce may be given to a child of 12 years, in quince-syrup or boiled milk. (Letulle.)

Bismuth subiodide and salol seem to diminish tympanites, control diarrhœa, and prevent hæmorrhage. The

two drugs administered alternately. Twenty-six cases were thus successfully treated. Farrar (Med. News, Jan. 16, '92).

VOMITING.—Many cases of vomiting, even that of pregnancy, will usually yield to the administration of 20-grain doses of one or other of the bismuth salts. It is not always tolerated by the stomach, however, that of infants especially. This drawback may be obviated by combining it with an aromatic powder or magnesia.

BLACK TONGUE. See TONGUE, DISEASES OF.

BLACK-WATER FEVER. See MALARIA.

BLADDER. See CYSTITIS and other individual diseases.

BLADDER, WOUNDS OF. See ABDOMINAL INJURIES, BLADDER.

BLEPHARITIS AND BLEPHARADENITIS.

Definition.—Blepharitis can best be defined as an inflammation of the Meibomian, or sebaceous, glands of the hair-follicles, and, secondarily, of the follicles themselves. It may occur as a symptom of some form of reflex irritation from refraction errors, or may accompany conjunctival irritations, stricture of the tear-duct, and inflammations of all sorts.

Symptoms.—Slight localized swelling at the edge of the lid is the first manifestation of the disease. This gradually spreads until the entire edge of the upper lid is involved. Crusts then appear around the bases of the cilia of the swollen part, and, the secretions being infectious, gradual extension to the lower lid follows. Some of the cilia in the inflamed follicles become loosened, and may easily be withdrawn without causing pain, or they may fall out imbedded in the crusts. Chronic conjunctivitis, phlyctenular conjunctivitis, and trachoma frequently occur as concomitants or complications.

Etiology.—Blepharitis is more common in strumous persons. It frequently presents itself as a result of excessive use of the eyes in reading, etc. Apart from the parasitic and traumatic varieties of blepharitis, it is usually of reflex origin, due to uncorrected refraction errors. As a rule, blepharitis ciliaris may be regarded as a sort of optical barometer or as an expression of the amount of functional strain; this is made manifest by a more or less intense variety of blepharitis or blepharadenitis (chronic blepharitis), and in my experience usually accompanies errors of refraction *other than myopia*. So-called "styes"—hordeola—accompany blepharitis, and, with retention-cysts and tarsal tumors, are the result of blepharadenitis or chronic blepharitis, with stenosis or stricture of the excretory ducts and abscesses of the Meibomian glands as a sequence. The varieties are:—

1. Blepharitis ciliaris: acute, simple; caused by reflex refraction error.

2. Blepharitis ciliaris: marginal and ulcerative, acute or chronic, conjunctival, trachomatous, diphtheritic, stricture of lacrymal duct, etc.

3. Blepharitis ciliaris: eczematous, squamous, exudative, pedicular.

4. Blepharitis ciliaris: furunculous, infectious, autoinfectious.

5. Blepharitis ciliaris: exanthematous, erysipelatous, phlegmonous, traumatic.

6. Blepharitis ciliaris: blepharadenitis, chronic Meibomian and follicular inflammation and obstruction.

Pathology.—If the crusts are washed

off and the base of the lashes are magnified and carefully examined, it will be seen that the mouths of the follicles no longer closely surround the cilia. The latter are thus loosened. In more advanced cases the follicles are destroyed by the inflammatory process and the lashes are no longer reproduced, the seat of their former implantation becoming bare cicatricial tissue. The loss of the protection afforded the eye from light and the mucous surfaces of the lid by the cilia increases the sources of irritation and inflammation; involvement of the lacrymal puncta may then give rise to lacrymation and eversion of the lid; conjunctival and corneal inflammations follow as formidable complications.

Prognosis.—Chronic congestion of the edge of the lids, with slight swelling, is a trivial condition which is promptly cured if judiciously treated. The ulcerative form is less easily mastered, and the complications that are likely to follow make it important that blepharitis receive attention in its early stages.

Treatment.—In the first and second varieties the crusts must be carefully soaked and mopped with a warm, alkaline solution in the hands of the patient until softened. They should not be forcibly removed. Pledgets of absorbent cotton should be used to sop or mop the crusts and not disturb the cilia, which are ever-ready to drop out. This tedious soaking process seldom occupies less than half an hour. In softening the crusts the head should be held erect and the basin containing the solution held under the chin, otherwise the blood by gravity congests the tutamina and partially defeats our purpose. The pledget of wet cotton should be held between the thumb and forefinger only, of the hand on the side to be soaked. If the back of the hand be kept uppermost and the other three fingers extended, the solution will not run down the arm nor wet nor soil the patient.

Having thoroughly removed the crusts, carefully dry the margins of the lids. In fifteen minutes' time wipe dry the edges of the lids and remove the fresh fluid exudation, which, if allowed to remain, dries and forms new crusts, and under these conditions all local remedial applications are of little use. This treatment must be persisted in, and requires the utmost patience. The yellow ointment of Pagenstecher has stood the test of years, and when this ointment will not effect a "temporary" cure—I use the word *temporary* advisedly —we must have resort to saturated solutions of nitrate of silver or even the solid nitrate itself. If rubbing a tiny scrap of the unguentum hydrargyri oxidi flavi (1 grain to 1 drachm of vaselin) upon the well-washed and thoroughly-dried edges of the eyelid and into the cilia does not effect a cure, we must have resort to the nitrate of silver, brushing a strong solution carefully upon the edges of the lids and around the cilia or actually cauterizing the ulcerated area around the openings through which the cilia project.

As we have said, it is but "temporarily cured." Unless the cause of a blepharitis be removed, it will return. We have treated the local condition and not removed the cause. This, in our experience, is due, in the majority of cases, to a refraction error (usually hyperopia), and is simply an expression of functional strain. A careful refraction worked out under full atropine mydriasis, or by the rapid method when the patient is over 45 years of age, is the best treatment for the simple, acute, and ordinary forms of blepharitis or blepharadenitis

that an experience of a quarter of a century now suggests.

The crusts are usually quite adherent, owing to their composition, partly to the sticky secretion of the Meibomian follicles, and partly to a varnish-like substance (serum) which exudes from the hair-follicles. A weak solution of bicarbonate of soda softens and detaches them.

Literature of '96-'97-'98.

Best results obtained with a solution consisting of hydrogen dioxide and water, equal parts. This accomplishes the desired result and does not pain the eye. It is to be applied with a bit of absorbent cotton, dipped into the dioxide solution and rubbed along the lashes. This should be kept up until the specific oxidizing effect is seen on the scales or crusts, as will be evidenced by the effervescence. The edges of the crusts will begin to separate. They are then to be dried with absorbent cotton.

There is a great advantage in using this remedy in children; it greatly lessens the pain of the treatment. It is also of special value where ointments of all kinds produce more or less irritation, and sometimes cause an aggravation of the symptoms. S. C. Ayres (Cincinnati Lancet-Clinic, Oct. 23, '97).

During the past year formalin employed in all cases of blepharitis. A tooth-pick with a small cotton mop wrapped on the tip so that it does not take up enough solution to run into the conjunctiva is used. The solution is made of the strength of $^{2}/_{10}$ per cent. to 1 per cent., beginning with the weaker. It must be frequently renewed or prepared at the time of using, in order to insure uniformity of strength. The lid is drawn away from the eyeball. The mop dipped in the solution is rubbed gently along the margin among the lashes until all the scales and crusts are removed and until the surface of any little pustule is rubbed off. A little bland oil may be applied afterward, or the formalin may be used in the oil. The applications are made daily, if possible, by the physician's hands. Otherwise they may be made by the patient at his home. Correction of all refractive errors is of prime importance: likewise the improvement of local or general conditions which may predispose the margins of the lids to disease will invariably improve all cases and will cure many of them. H. Moulton (Jour. of Amer. Med. Assoc., Sept. 17, '98).

Large number of cases of blepharitis treated with picric acid always with good results. Picric acid is used in aqueous solution of strength 5, 8, and 16 parts per 1000, or corresponding strength made with equal parts of water and glycerin. The yellow coloration of the tissue which it causes is not a great inconvenience. It is very necessary before applying the picric-acid solution to the diseased surfaces to soften them well and clear away the crusts which cover the eyelids by means of a hot solution of boric acid or of ichthyol. The applications are renewed every second day. In glandular and ulcerous blepharitis, after having cleansed the ciliary border, opened the little pustules, and extracted the eyelashes most affected, the base of the ulcers are touched with a little pledget of lint soaked in picric-acid solution 10 to 1000; then, after two minutes, the whole of the edge of the eyelid is treated with a weaker solution. Fage (Lyon Méd., Jan. 9, '98).

A 50-per-cent. ointment of ichthyol may be applied directly to the mucous membrane as a cure for blepharitis. A. Peters and Darier (Amer. Medico-Surg. Bull., Sept. 10, '98).

Blepharitis ciliaris (eczematous) occurs as a concomitant of eczema, seborrhœa, and other skin affections, and as a complication of vaccinia, syphilis, and other infectious processes, or may be parasitic, and is to be treated according to the rules of therapy in dermatology. Pediculi palpebrarum looks like a lid with a double row of cilia and readily yields to applications of unguentum hydrargyri.

Case of vaccine blepharitis. Lower lid showed two ulcerating patches at the ciliary margin, close to the external canthus. Infection probably occurred from contact with a vaccine pustule on the arm of a sister. C. Zimmerman (Archives of Ophthal., Apr., '92).

Case of accidental vaccinia of the eyelids; latter œdematous and painful, their edges at both outer canthi exhibiting a purulent ulcer with indurated margins. Thompson (London Lancet, July 23, '92).

Case of vaccination ulcer on the upper lid of a female adult, probably inoculated while washing a child, which had recently been vaccinated. Hirschberg (Centralb. f. prak. Augen., Jan., '92).

Blepharitis ciliaris (furunculous) is a variety peculiar to no local or reflex condition, but is caused, as a rule, by an infection. Such inflammations follow the usual course of furuncular inflammations and abscesses, and the secretion from the localized slough furnishes the typical "furuncle bacillus." For this reason alone the boils, or furuncles, not necessarily "styes," recur, and acute autoinfection through the mouths of the Meibomian follicles occur and recur, unless severe antiseptic precautions are rigidly enforced. Hot fomentations with boiled water, followed by drenchings with borated or weak sublimate solutions (1 to 3000) are best. When furunculous abscesses are evacuated spontaneously or by the knife, a focus of infection is established, and we must use dilute listerin, Dobell's solution, Seiler's solution (tablets), electrozone, or dioxide of hydrogen, until complete healing has taken place. Fomentations are best made while the patient reclines. Squares of "spongiopilin" or pledgets of absorbent cotton covered with "oil-silk" are most convenient. Following hot fomentations, the eye should be lightly covered and protected from draughts.

Half-grain doses of sulphide of calcium in pill form two or three times a day after meals are recommended as a preventive for styes. Sympson (Brit. Med. Jour., Nov. 24, '88).

Hydrogen dioxide of special value in the treatment of blepharitis marginalis. After the eye has been cocainized the drug is applied to the lid upon a cotton tampon. Daily sitting. Ayres (Amer. Jour. of Oph., Feb., '94).

Successfully employed the above treatment for the past two years. Essad (Recueil d'Ophtal., Apr., '94).

Loss of cilia caused by destruction of glands is seldom seen, but such loss of cilia robs the eye of its protection against light. Cilia generally grow again unless the edges of the lids are sclerosed and deformed with cicatrices from neglected ulcerations about the mouths of the hair-follicles.

Closure of the puncta lacrymalia is a most serious complication. All careful operators take great pains to cleanse the cilia, especially the superior ones in any case. It is unsafe to operate with blepharitis present, as the secretion would infect the wound.

In phlegmonous, or erysipelatous, blepharitis ciliaris with abscess of the upper lids, and in cases of ecchymosis or other swellings, these should be evacuated, the eyeball being cut into.

A fact worth noting is that blepharitis ciliaris is seldom found accompanying myopia.

If blepharitis ciliaris is a symptom of functional strain of reflex eye origin, headaches are seldom present. If, on the contrary, headaches are the one symptom, blepharitis, or blepharadenitis, is generally conspicuous by its absence.

If one eye be used more than the other, or if one eye be not used at all, more or less blepharitis ciliaris will likely indicate the amount of strain.

Blepharadenitis is only an aggravated subacute or chronic form of blepharitis ciliaris, in which the mouths of the

Meibomian follicles have become closed and the lining membrane of the glands has become subacutely or chronically inflamed. Retention-cysts and abscesses with pyogenic membranes secrete pus from granulating sacs and deform the lid.

Unless every particle of diseased gland with its pyogenic membrane be carefully removed, recurrence will take place, and injury to the tarsal cartilage will cause deformity. Epiphora, entropium, and ectropium will ensue, and with them what is best described as "wrinkled lid" will remain as a permanent source of trouble, and rub its irregular surfaces over a cornea doomed to destruction from irritation and ulceration.

We can recall the time spent years ago in fighting blepharitis and blepharadenitis until its true cause was recognized and understood. At present, and in the light of modern ophthalmic surgery, we recognize in blepharitis, or blepharadenitis, only a symptom which in a general way promptly yields to treatment when we remove the cause. The elimination of the latter as promptly brings relief in other directions: not only by improving the vision, but also by curing life-long headaches and other neuroses.

Charles S. Turnbull,
Philadelphia.

BORACIC ACID.—Boracic, or boric, acid appears in the form of white, translucent or lustrous scales or needles, and is usually prepared by adding hydrochloric acid to a hot solution of borax (sodium borate); when comparatively fresh it exhales a faint odor of benzoin. It has a warm, acrid taste; acid reaction; and is freely soluble in alkaline media, in oils, and in chloroform; 1 to 3 in alcohol; 1 to 15 in boiling and about 1 to 25-50 in cold water. The solubility in cold water varies so greatly with different specimens as to seem unaccountable, but doubtless depends upon the source of the acid, the mode of its manufacture, and the resultant purity or impurity. In 1889 Catanis proposed to render the acid more soluble by mixing 120 parts with 10 of calcined magnesia and 750 of water, whereby a considerable proportion of the former is in solution in excess.

From the fact that boracic acid forms borates with most of the alkaloids, it has been advised that they be employed when the acidity of the drug is to be feared.

Preparations and Dose.—Boracic acid, 5 to 15 or 30 grains.

Borate of ammonium, 10 to 20 grains.

Borate of sodium (borax), 15 to 30 grains.

Borate of zinc, for external use only.

Physiological Action.—Boracic acid and all its salts are deemed more or less antiseptic, and the former has attained special repute because of its inexpensiveness, general harmlessness, and unirritating character. But purity is always a matter to be carefully considered, both as regards external and internal use. It is not so commonly employed as an internal medicament, perhaps, as the sodium salt, because of its somewhat pungent and acid taste, and partly because it is deemed less convenient to prescribe in aqueous mixtures. In excessively large doses, however, both it and the salts depress the spinal centres, and may produce progressive loss of voluntary and reflex activity without affecting nerve or muscle. Schiff is responsible for the statement that boracic acid, when locally applied to nerves, causes the part to lose the power of originating, but not of transmitting, impulses; so

that, if the galvanic current be applied to the part of the nerve which has been exposed to the drug, no muscular contractions result; but, if the poles be placed above this part, the distal muscles respond at once (Wood). Some persons, however, appear to be able to bear with impunity almost fabulous doses of the drug, which evidences that its exact physiological *status* is undetermined and chiefly a matter of speculation.

In doses of 30 to 60 grains often repeated, boracic acid is likely to induce nausea and vomiting, and, if persisted in (or even in large, single doses), to give rise to a concatenation of symptoms indicating gastro-enteritis.

Bruswanger (von Renterghem and Laura) remarked diuresis with increased desire to urinate to follow doses of from 30 to 120 grains; he believes that the acid is eliminated through the kidneys as an alkaline borate, in which conclusion Rabuteau concurs. Polli, however, does not believe that the acid undergoes any alteration, but that it is passed unchanged. H. C. Wood states that it is rapidly eliminated with the urine, and also escapes with the perspiration, saliva, and fæces. It increases elimination of urea, as well as the flow of urine.

Untoward Effects.—Though Gaucher insists that it would require 2 1/2 ounces, per day, administered for several days in succession, to produce dangerous symptoms, his confidence is not supported by general evidence, for it has been known, in considerably smaller doses, to induce parenchymatous nephritis. This is especially true of its sodium salt, which is a dangerous remedy as regards most renal maladies, and seems to possess the power of provoking malignant degeneration where a morbid process has already been set up in the kidneys. George T. Welch reports two cases in which the application of tampons of powdered boracic acid produced general toxic symptoms: in one case the skin had a dried, "charred" appearance, and in the other there was collapse; in both there was very marked coolness of the vagina. Mododewkow chronicles a death from washing the stomach with a 2 1/2-per-cent. solution; but there are no valid grounds for believing the medicament had any thing to do with the fatality. Lemoine observed a bluish-gray line on the gums, as if from lead poisoning, in a case of epilepsy to which sodium borate had been given. Branthomme also reports two cases suffering with carbuncle who were poisoned through the daily application of 30 grains of the acid. The symptoms had no relation to the malady, for in the one case was restlessness and a feeling of burning under the whole skin, intense thirst, a temperature of 38.8° C., and the body covered with red patches; in the second case an eczematous eruption, anorexia, and insomnia appeared. In both cases the untoward symptoms subsided immediately on withdrawal of the acid applications. What is said of the acid will, in a general way, apply to its salts.

Therapeutics.—The scope of boracic acid as an antiseptic is very wide, for it has been employed in almost every conceivable surgical process: as a detergent for painful and suppurating wounds and ulcers; as a basis for injections and ointments of all kinds; in collyria; as an insufflation powder for the ear; to wash out irritable bladders and dilated stomachs; as an application to skin maladies.

> In suppuration of the middle ear packing of the meatus with pure, impalpably-powdered boracic acid is to be preferred to insufflation; this method is

safe if the ears be inflated daily. Seely (Weekly Med. Review, Mar. 10, '89).

Otorrhœa is one of the most difficult to cure of all conditions affecting the ear. Boracic acid perfectly meets the indication of a non-irritant antiseptic. Bacon (Amer. Ther., June, '95).

Boracic acid has been very extensively employed in the treatment of eye maladies. Bourgeois, of Rheims, recommends it for phlyctenular and granular conjunctivitis; Smith, of Chattanooga, as a wash for ophthalmia neonatorum; Dimissas introduces, every night, an ointment of boracic acid between the eyelids after operating for cataract; but Noyes declares the drug should be used with caution, and of a strength of not more than 1-per cent., since he has seen a diffuse keratitis develop from a 4-per-cent. solution.

It is probable, however, that, when untoward results accrue to the use of a 4-per-cent. solution in the eye, even after cataract extraction, such is due to the quality of the acid employed.

In the milder form of conjunctivitis I spray the membrane with a solution of boracic acid and salt, the good effects obtained being due, doubtless, to the fact that the liquid penetrates the deeper tissues, and correspondingly increases the extent of the contact of the acid. De Schweinitz (Ther. Gaz., '90).

In measles, too, frequent bathing of the eyes, nose, and ears with warm boracic acid solution is to be recommended as beneficial and comforting to the patient.

This drug has, also, been employed in the treatment of chancroid as a dusting-powder; as an injection, and also internally administered, in cystitis; in naso-pharyngeal catarrh, especially the troublesome form seldom seen except in children; in chronic constipation, by applying the dry powder direct to the rectal mucosa; in watery solution and in ointment form to the urethra for gonorrhœa; in the form of ointment to the pustules of variola to prevent pitting, etc.

In spite of the reputation accruing at one time, it is doubtful if any material benefit is ever derived from the use of this acid in any but the milder and less stubborn varieties of skin disease. It may, however, prove a valuable adjunct to other treatment.

When there is a profuse discharge from an eczematous patch, I direct the latter to be washed with a weak solution of boracic acid, then dried with muslin bags containing the dry acid duly incorporated with finely-powdered starch. Malcolm Morris (Practitioner).

Similar procedures have been recommended by many authors. Gaucher, corroborated by Sevestre, Compy, and Cadet de Gassicourt, however, goes further, and declares that he has secured rapid recovery in eczema, and also in contagious impetigo, by employing it in glycerole of starch, 1 to 30; he insists that this combination offers all the good to be obtained from oil of cade without any of the disadvantages of the latter.

In the erysipelas of the newborn Lemaine lauds this drug above all others. He holds that the malady is derived from an attenuated puerperal septicæmia in the mother, and so directs the application of hot solutions of the acid, and subcutaneous injections of the same, cooled, twice daily.

Matigon, of Bordeaux; Mackenzie and Abbott, of London, as well as many others, express a decided preference for boracic acid, or for the tetraborate of sodium (this latter being merely a combination of boracic acid and borax), above all other medicaments for the purpose of preparing solutions intended to

be used in the pleural cavity, especially after pneumotomy or aspiration.

In 1890 Edmund Andrews, of Chicago, published the results accruing to a series of experiments undertaken to determine the value of the acid as an antiseptic. He placed 2 drachms of fresh pork muscle in each of a series of bottles, and added different percentages up to complete saturation of acid solution. The result seemed to prove that even the strongest solution cannot inhibit the growth of mycelia, and further that no species of germs can thereby be entirely prevented from growing; that boracic acid only covers a raw surface with a moisture that is not distinctly antiseptic, but is nevertheless rather unfavorable to the growth of bacilli. Unfortunately for Dr. Andrews's conclusions, however, they are based upon incomplete experiments, and consequently imperfect data. As has before been remarked, the acids of commerce vary greatly according to source and mode of manufacture; consequently a series of experiments should have been made with different products. Moreover, the evidence is now overwhelmingly positive that a moderately pure boracic acid is antiseptic, though only in slight degree; but it commends itself to the medical man especially because it is practically odorless and innocuous.

Internally the acid appears to have been successfully employed in a variety of maladies. Gaucher administered from 7 to 20 grains daily to a number of patients suffering with pulmonary tuberculosis, and claims that both the local and general symptoms were improved, while the sputum lost its fœtid character; it had, however, no action upon the bacilli.

Tertschinsky gave boracic acid in 240 cases of enteric fever in doses of from 12 to 15 grains three or four times daily, with only nine resulting fatalities. Keegan also successfully employed it in a considerable number of cases.

Ammonium Borate.

This may be prepared by dissolving 1 part of boracic acid in 3 parts of hot liquor ammonia of a specific gravity of 0.960, and cooling to crystallization. It appears as white or transparent eight-sided crystals, with strong ammoniacal odor; soluble in the ratio of 1 to 12 in cold water. It is employed both topically and internally in cystitis, and internally in renal diseases, where, in either case, there is an excess of acid or earthy phosphates. The value of the remedy, however, is doubtful, though in some few instances it appears to afford slight relief. It has been tried in epilepsy also, but with negative results.

Sodium Biborate; Sodium Borate; Borax.

This, the best known and most generally employed internally of all the borate salts, has for many centuries been alternately lauded and condemned by the medical profession, though it has always retained a *status* in domestic pharmacy and therapeutics. As found in the shops, it appears in colorless transparent monoclinic prisms, shining, odorless, and effervescent in dry air. It is soluble in half its weight of boiling water, 1 to 16 in cold water; insoluble in alcohol, but very soluble in glycerin and fats.

Literature of '96-'97-'98.

The addition of a small amount of sugar greatly increases the solubility of borax; it will also rapidly liquefy a solution of gum arabic which has become gelatinous from the presence of borax. Editorial (Amer. Medico-Surgical Bulletin, Oct. 25, '97).

It also has a faint, sweetish taste and alkaline reaction; in solution it absorbs

carbonic acid and dissolves fibrin, albumin, casein, and uric acid.

As a general rule, sodium borate behaves like the alkalies, and, therefore, it should not be associated with the salts of the alkaloids. In mixtures of this kind the patient is likely to take most of the alkaloid in the last dose, with harmful effect. A. Dujardin (Union Méd. du Nord-Est, Nov., '91).

Therapeutics.—As an application to mucous membranes, because of its mildly antiseptic and soothing effects, borax in solution is almost without a peer; many maladies make most happy recoveries under its use that with other remedies of more pronounced astringent or irritant character prove most vexatious. Especially is this true of some of the lesser diseases of the eye and nasopharynx, the milder forms of conjunctivitis, certain forms of rhinitis, ulcerative stomatitis, etc. Sodium borate in camphor-water secures a pleasant, harmless, and grateful collyrium that may advantageously be employed, either alone or in connection with other remedies, in most inflammatory conditions of the eyes.

In atrophic rhinitis solution of sodium borate in glycerin, sufficiently diluted with water, may be sprayed into cavities; glycerin prevents formation of crusts; sodium borate prevents decomposition of exudation. Musehold (Revue Inter. de Méd. et de Chir., Apr. 25, '95).

In ulcerative stomatitis, swab with water acidulated with a few drops of acetic acid and follow by painting with borax (1 part) dissolved in glycerin (8 parts). Garrigues (Med. News., Oct. 1, '92).

There can be no doubt of the value of boracic acid and borax as local applications in aphthous ulcerations, diphtheria, and other inflammations of the mouth, in which the crystals of the sodium salt may be permitted to slowly dissolve on the tongue. H. C. Wood ("Therapeutics: its Principles and Practice," ninth ed.).

Literature of '96-'97-'98.

Sodium borate is frequently employed against stomatitis and against aphthous ulcerations of the mouth, as in ptyalism, glossitis, anginas, etc. It is evident that the antizymotic property of sodium borate is the deterring influence. Von Renterghem and Laura (Dosimetric Med. Review, Dec., '97).

The last authors quoted very justly believe that this medicament offers certain advantages in the treatment of some skin diseases, since it may be employed topically to dissolve the pellicles of the epidermis joined together by sebaceous matter, thereby acting as a detergent; in pruriginous or eczematous eruptions due to the accumulation of products of the sudiparous glands the salt is often most effective.

Congenital ichthyosis in a child treated by washes of sodium borate. Sherwell (Jour. Cut. and Genito-Urin. Dis., Sept., '94).

In erysipelas Sevestre employs baths at 93.2° F. containing 16 ounces of sodium borate, which, he claims, lowers the temperature and tends to heal the eruption.

In 1894 Ciaglinski and Hewelki described a case of black tongue presenting a patch of mold extending as far back as the circumvallate papillæ that contained black pigment and closely resembled the fungus known as *Mucor rhizopodiformis*. By means of borax washes the tongue became clean in a couple of days.

Both borax and boracic acid have been recommended as injections for an inflamed bowel, but their utility cannot be very pronounced.

In severe cases of infantile diarrhœa daily irrigation of the larger bowel is most beneficial during the height of the disorder. I employ borax: 1 drachm

to a pint of warm water. Carter (Provincial Med. Jour., May 1, '94).

That sodium borate has some action upon the central nervous system is apparent, but this is so ill understood that it is impossible to formulate any definite physiological basis for its internal administration. It has been empirically recommended for a multitude of diseases, including locomotor ataxy, paralysis agitans, cholera, etc.

Have used sodium borate with excellent results in paralysis agitans. Sacaze (Bull. de la Soc. de Méd. Mentale de Belgique, Mar., '94).

Borax in doses of 80 to 90 grains daily is to be highly recommended as a prophylactic against cholera. During the epidemic in Italy during 1864-'65 none of the villagers employed in the borax works were affected, while in a village in close proximity one-third of the inhabitants died. I opine that the drug kills the germs in the alimentary canal. Cyon (Compt.-Rend. Acad. Sci., xcix, 149).

Looking at the drug from the standpoint of the author last quoted, and admitting its mildly antiseptic property, —which are undoubted,—it is easy to discover the reasoning that has led to its use in septic diseases. So, too, the solvent action of the borates as regards uric acid, and their tendency to eliminate urea, explain why borax often yields gratifying results when employed in uric-acid lithiasis; but it should always be most freely diluted with water. Another peculiarity of borax, also undefined, is its affinity for the genito-urinary organs. In some cases it relieves uterine hæmorrhage with surprising promptness: an action that can only be explained by reflex through the nervous system.

But it is in epilepsy that borax has been most exploited in recent years though its use in this direction is by no means new; and for a brief period it was thought an absolute panacea had been discovered. But H. C. Wood, who tried it in a number of cases, succeeded only in inducing marked gastro-intestinal irritation in every patient.

Borax as a means of relief seems to have established for itself a fixed and permanent position. Gray, Pritchard, and Shultz (Annual of the Univ. Med. Sci., vol. ii, '94).

Of twenty-five cases one was cured and all relieved but six. Treatment was continued from one to seven months. Dijoud (Lancet, July 18, '92).

Borax is a useful remedy against convulsive attacks of an epileptic character. Angelucci and Pieraccini (Lo Sperimentale, No. 1, '94).

Borate of soda is superior to potassium bromide in symptomatic epilepsy, but of less value in nervous epilepsy. Mariet (Le Prog. Méd., Oct. 10, '92).

The prolonged exhibition of the salt may induce cutaneous troubles, consisting principally of seborrhœic eczema of the scalp. The hair is shed, but grows again when the administration of the borax is stopped. Féré (Lancet, Dec. 23, '93).

In order to avoid gastric and skin troubles by reason of large doses, I would suggest the borax be given with considerable doses of naphthol or bismuth salicylate. Féré (La Semaine Méd., Feb. 4, '92).

Borax given alone is disappointing in some respects, but given with the bromides its action is much better and the combination superior to either drug alone. Alexander (Liverpool Medico-Chir. Jour., July, '94).

On the whole, borax is of no value in epilepsy. Lui and Guicciardi (Revista Speri. di Fren. e di Med. Legale, etc., Sept., '95).

It may be imagined that under certain circumstances borism may give rise to accidents every whit as grave as those of bromism, with the difference that those arising in the kidneys are more insidious and more difficult to remove.

This fact, more than all else, perhaps, has led to a very general abandonment of the drug, though a few still persist in its use, with more or less varying results that apparently depend upon the tolerance exhibited by the individual patient.

Tetraborate of Sodium.—Boymond, in 1893, called the attention of the Société de Thérapeutique to a new product which he termed "boro-borax," and for which was likewise claimed antiseptic properties superior to those of corrosive sublimate. This is simply the tetraborate of sodium in solution, and appears to be a trifle more powerful than a corresponding solution of boracic acid. A solution may be extemporaneously made by adding 26 drachms of boracic acid to a quart of distilled water and then neutralizing by sodium borate.

Zinc Borate, or Tetraborate.

This is an amorphous, white powder obtained by the interaction of zinc sulphate and sodium borate in hot water. Like all new agents of its class, when first introduced wonderful antiseptic power was claimed for it, but this appears to have not been sustained. It is freely soluble in acid media only; has been employed as a dusting-powder for raw surfaces; but it does not appear to offer any advantages over boracic acid, while its almost insoluble character inhibits its use in conditions where the latter is always available.

BRAIN. See Cerebral Abscess, Cerebral Hæmorrhage, Encephalitis; Head, Injuries of, etc.

BREAST. See Mammary Gland.

BRIGHT'S DISEASE.

Acute Nephritis.

Definition.—An acute inflammation of the kidneys, and either of a mild, severe, or grave character. It may be more or less diffuse in nature. Three varieties of acute renal disease are described by Delafield under the term acute Bright's disease: (1) acute degeneration of the kidneys, (2) acute exudative nephritis, and (3) acute productive nephritis.

Symptoms.—The onset is sudden, as a rule, but varies with the exciting cause of the nephritis. Chilliness, nausea and vomiting, pain in the back, and, within twenty-four hours, dropsy are seen in some cases. Children are subject to convulsions (uræmic), and in severe cases adults are no less liable. Fever may be present, but it is neither constant nor high. The early appearance of œdematous puffiness of the eyelids and face, and of pallor of the skin, is characteristic. Soon, and sometimes at first, a swelling occurs about the ankles and legs, and in severe cases dropsy involves the whole body. The scrotum, penis, or labia may, in such cases, become enormously distended, the skin presenting an almost translucent appearance.

Often local symptoms are absent, as pain and tenderness in the lumbar region; they are never marked. Micturition may be frequent and accompanied by a slight burning and vesical tenemus, due to the concentrated urine. In very severe dropsy the tense, dry skin may become sensitive or even painful on pressure. Bodily movements are often painful and difficult in cases of marked anasarca. Uræmia may be heralded by intense headache and backache.

A urinary examination is always necessary, as in mild cases the renal condition may be overlooked. There may be no further symptoms than a general malaise.

The urine in acute nephritis furnishes distinctive characteristics. The total

quantity passed in twenty-four hours is diminished, and may even be very scanty, varying from 5 to 25 ounces (150 to 740 cubic centimetres). There may be suppression in cases of toxic origin, when an acute degeneration or necrosis of the renal epithelium occurs, and in the very severe exudative inflammations.

The specific gravity is early increased to 1025 or more, though later it may fall to 1015 or 1010. The color is darker than normally and is usually smoky-red, or reddish-brown, according to the amount of blood contained. A more or less abundant flocculent sediment appears on standing, if the normal morphological constituents are present in great quantity.

Some red blood-corpuscles and renal epithelium are found microscopically, together with the characteristic hyaline, blood, and epithelial tube-casts. The urine is acid in reaction, and on boiling throws down a thick, curdy precipitate of albumin, which varies in weight from ¼ to 1 per cent. The urea is diminished.

There may also be other symptoms during the course of acute Bright's disease, as those of hydrothorax, ascites, and hydropericardium, in cases in which great general œdema is present. The first-named condition is bilateral and gives rise to dyspnœa; the second increases the dyspnœa by pressing the diaphragm upward; and the last impedes the heart's action. Strümpell describes a form of pneumonia that sometimes develops in severe cases of acute nephritis,—a "stiff inflammatory œdema,"—midway between lobar and broncho-pneumonia. There may also be œdema of the conjunctivæ, soft palate, and larynx.

The pulse is often hard and tense, and, though slow at first, it may become accelerated later. Cardiac hypertrophy may be present in a slight degree. The aortic second sound is accentuated. Epistaxis appears occasionally, and subconjunctival hæmorrhages sometimes follow unwitnessed uræmic convulsions. Dryness and uræmia of the skin form a constant condition. Uræmic manifestations may supervene at any period in the disease, appearing early in the most severe cases, with intense headache and backache, vomiting, and convulsions.

The above may be considered a description of the common form of acute nephritis resulting from exposure; the clinical course differs somewhat in other cases. Occurring as a complication of the infectious fevers, except scarlatina, acute nephritis may be characterized by the very slight degree, or even by the absence, of dropsy. Albuminuria, hæmaturia, anæmia, and uræmia mark the graver affections. In scarlatinal nephritis, however, anasarca is common, and a slight œdema, at least, is quite constant. Mild affections show simply a slight quantity of albumin and a few hyaline casts, indicative of the parenchymatous degeneration. The typhoid state may follow the subsidence of the acute toxic symptoms in cases of degenerative nephritis due to mineral poisoning; this is marked by prostration, muscular twitchings, stupor, coma, and death. Hæmaturia may be pronounced in the so-called nephro-typhoid condition, in which typhoid fever begins with marked symptoms of acute nephritis. The nephritis of pregnancy, as a rule, is gradual in its onset. The albumin increases in quantity from month to month, reaching a high percentage during the eighth and ninth. Some hyaline casts are found; but otherwise there are few morphological elements. Red blood-corpuscles rarely may be seen in the

urine. Up to the time of delivery the danger of eclampsia is constant, but recovery is rapid in uncomplicated cases after the birth of the child.

In acute (productive) nephritis, where there a tendency to the formation of patches or wedges of fibrous tissue, there is a higher fever, there are cerebral and circulatory disturbances of a typhoid nature, as well as anæmia, dropsy, and a highly albuminous urine, even though there be no blood-corpuscles and few casts. Dropsy is most marked in the legs. There are a progressive and rapid loss of flesh and strength, dyspnœa, vomiting, diarrhœa, and convulsions or coma and end in death. Milder cases last from two to four weeks, and apparently recover; albumin and casts persist, however, until another and a similar attack occurs after an interval of weeks or months. Thus, the first acute attack is subject to chronic recurrence, until a fatal seizure takes place.

Etiology.—Acute nephritis more often appears before than after the middle time of life, though it may occur at any time. Males are more often attacked than females.

> Analysis of 270 cases of Bright's disease. Nephritis occurred more frequently in males than in females (3.309 to 2.74); most common during the period of greatest activity of the body. Of the 270 cases, 140 were acute, 85 being hæmorrhagic. Of these 140 cases of acute Bright's disease, 70 per cent. could be traced to acute infectious diseases, only 2.85 per cent. being directly traceable to cold. Agnes Bluhm (Deutsches Archiv f. klin. Med., B. 17, H. 3, 4).

Occupations necessitating exposure to cold and wet offer special predisposing conditions. The long-continued use of alcohol will also, as a rule, prove a predisposing cause of acute Bright's disease.

Among the exciting causes of acute diffuse nephritis are:—

1. Those acting on the skin, as cold, dampness, extensive burns, and chronic skin diseases. It is often difficult to determine the relative influence of alcoholic excesses and the exposure incident thereto. Acute intoxication from beer-drinking may result in an acute nephritis, but it is yet likely that in most cases the exciting cause is the cold acting upon the individual in his exposed and maudlin condition. Acute nephritis may also be caused, at times, by exposure to cold and wet apart from and in the absence of alcoholic indulgence; in such cases it is to be presumed that there is an inherent weakness of the kidneys, or a susceptibility rendering these organs the vulnerable point in the system.

The physiological toxic agents embrace the poisons of the acute infections; in a majority of cases, however, scarlet fever is the primary affection. Usually the nephritis appears during the second or third week of convalescence, though it may supervene at the height of the disease.

> Among 97 cases of scarlet fever, but 4 exhibited the symptoms of Bright's disease. Of 45 cases of measles but 1 evinced renal involvement. In 162 cases of erysipelas, Bright's disease occurred 7 times and simple albuminuria 17 times. Among 481 cases of variola it appeared but once,—in a child 12 months old. In 93 cases of diphtheria it occurred but 4 times and simple albuminuria but 6 times. Of 74 cases of tonsillar angina, 4 cases presented evidence of nephritis and 20 were albuminuric. Among 10 cases of ulcerative endocarditis it occurred once. Out of 360 cases of acute rheumatism, but 4 were affected secondarily by acute Bright's disease. Acute nephritis is not rare in acute pneumonia, occurring in 26 out of 140 cases. Agnes Bluhm (Deutsche Archiv f. klin. Med., B. 17, H. 3, 4).

Copious evidence showing that Bright's disease may be epidemic and occur as such apart from scarlatina; that it may also occur with scarlet fever under the same forms as when epidemic without the latter; that in the same epidemic all the forms of nephritis may occur, from the acute to chronic; that between the chronic epidemic form and the common chronic variety there are no differences of symptoms or course; that the epidemic form, when uncared for, is apt to become chronic just as the ordinary acute Bright's disease. Fiessinger (Gaz. Méd. de Paris, Oct. 10, '91).

Very grave nephritis supervening in the first seven days of scarlet fever, thus differing from the late nephritis; to it must be ascribed the fatal termination sometimes noticed in the early stage of scarlet fever. Inflammation extending to the papilla constitutes the most essential characteristic; leads to retention of urine and dilatation of the canaliculi. Aufrecht (Rev. des Sci. Méd. en France et a l'Etranger, July 15, '94).

Case in which nephritis only appeared three months after scarlet fever. There was tuberculosis. Gouget (Bull. de la Soc. Anat., Jan., '94).

2. Acute nephritis may also be the result of other of the infectious fevers (small-pox, typhus, typhoid, relapsing fever, cholera, diphtheria, yellow fever, measles, chicken-pox, erysipelas, septicopyæmia, acute lobar pneumonia, cerebrospinal meningitis, dysentery, acute articular rheumatism, and tuberculosis; syphilis is rarely a cause).

Case of nephritis, and with it severe cerebral symptoms, occurring after revaccination in a man 40 years of age, previously quite healthy. History of recent alcoholic excess. Goldstein (Inter. Centralb. f. die Phys. u. Path. des Harn u. Sexualorgane, p. 93, '91).

Case of acute nephritis following an attack of whooping-cough in a little boy. The whooping-cough had been quite severe, but the child was apparently recovering nicely, the coughing having disappeared, when a relapse occurred. Within the first forty-eight hours of this relapse the renal complications became noticeable, and a uræmic condition rapidly supervened, characterized by œdema of the lids and dependent parts and by stupor. Patient recovered. Hollopeter (Med. and Surg Reporter, Jan. 10, '91).

Interesting case of hæmorrhagic nephritis consecutive to grippe, in a woman 32 years of age, the hæmaturia lasting three weeks. Bock (Deutsche med.-Zeit., Apr. 2, '94).

Case of albuminuria which occurred in the course of a subhepatic pleurisy which arose without apparent cause. Beaugnies-Corbeau (Jour. de Méd. de Paris, Apr. 5, '91).

Case in which mortal nephritis followed mumps. Le Roy (La France Méd. et Paris Méd., Nov. 23, '94).

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Occurrence of nephritis in secondary syphilis in a case investigated in Birch-Hirschfeld's laboratory. The patient died in coma. At autopsy the lungs, spleen, liver, lymphatic glands, and kidneys were all found to be the seat of more or less interstitial inflammation. The kidneys were large, and on section showed signs of subacute interstitial nephritis; the epithelium of the tubules, which were much compressed, was only slightly affected. These changes believed to have been due to syphilis. The nephritis could not have been of mercurial origin, for it would have been parenchymatous and not interstitial. Doederlein (Münchener med. Woch., Oct. 13, '96).

It may also supervene as a primary condition, and the brunt of the attack may be sustained either by the kidney, rather than by any other part, or by the organism as a whole, as in the fevers. Mannaberg has described such cases, and has demonstrated the presence of streptococci in the urine.

Relation of acute nephritis and the streptococci found in endocarditis, especially those of experimentally induced bacterial endocarditis. In eleven cases

of acute Bright's disease the urine found to invariably contain streptococci, which disappeared from the excretion with the disappearance of the symptoms of disease. In patients affected by other maladies, and in healthy individuals, this micro-organism was not found, although searched for in a long series of samples of urine. Mannaberg (Zeit. f. klin. Med., B. 18, H. 3, 4).

A number of cases of renal inflammation due to a characteristic bacillus, from cultures of which he has been able to reproduce the nephritis in rabbits. The symptoms are in general similar to those in other cases of nephritis, but usually are of a mild form, and are apt to show a predominance of the gastric phenomena. Letzerich (Zeit. f. klin. Med., B. 18, H. 5, 6).

Case of primary acute hæmorrhagic nephritis, in a man 42 years of age, coexistent with the presence in the urine of large quantities of the staphylococcus pyogenes albus. Baduel (Riforma Med., Aug. 7, '94).

Bright's disease, an infectious disorder in which the micro-organisms act upon the kidneys. (1) Hyperacute infectious Bright's disease; (2) acute infectious Bright's disease; and (3) attenuated infectious Bright's disease. Fiessinger (La Sem. Méd., May 12, '94).

The tendency even now is to attribute too large a share to cold in the causation of nephritis. Taking the infective diseases alone, the alterations brought about by the micro-organisms in the renal tissue may pass without leaving any trace, but they may also become chronic, causing changes in the epithelial elements and interstitial proliferation. M. Vignerot (Arch. Gén. de Méd., Oct., '91).

Renal inflammation characterized by the presence of micro-organisms, which present themselves as rods and spores (cocci), the former three micromillimetres in length, sometimes bearing a sporangium. Hopkins (Pacific Med. Jour., Apr., '90).

Case in which nephritis was due to infection through skin wound. Sacaze (Revue de Méd., Feb., '95).

Case in which ulcer appeared as first symptom in case following a rapid course, showing at autopsy degeneration of convoluted tubules with slight arteritis. Etienne (Le Bull. Méd., July 14, '95).

Seventy cases showing causal relationship between ulceration of the duodenum and interstitial or tubal nephritis, or both combined. Perry and Shaw (Practitioner, Dec., '94).

Case showing that absorption of alimentary ptomaines which kidneys cannot eliminate may give rise to lethal poisoning. Dieulafoy (Annual, '96).

When toxic substance reaches kidney through nutritive artery it exerts an elective action upon the epithelial cells of convoluted tubules, with lesions of protoplasm, steatosis, and coagulation necrosis. Vandervelde (Jour. de Méd., de Chir., et de Pharm., vol. iv, No. 2, '95).

3. Chemical toxic agents include turpentine, cantharides, carbolic and salicylic acids, potassium chlorate, iodoform, the mineral acids, and inorganic poisons, such as phosphorus, arsenic, mercury, and lead. Acute renal inflammation may be caused by the excessive ingestion of highly-acid, spiced, or adulterated foods (as from salicylic acid and lead chromate).

Large number of substances—cantharides, styrax, balsam of Peru, cubeb, turpentine, mustard- and croton- oils, naphthol, carbolic and oxalic acids, phosphorus, etc.—which act upon the kidney as poisons by causing acute diffuse nephritis. Lenzmann (Deutsche med.-Zeit., Aug. 6, '94).

Two cases of acute nephritis, in children 8 and 6 years of age, after the use of betanaphthol ointment for the purpose of curing the itch. The youngest child died. Baatz (Centralb. f. klin. Med., Sept. 15, '94).

Experiments with various toxics and clinical facts show that the pathological process is a uniform one, the epithelium of the convoluted tubules, the epithelial cells of the straight tubules, the glomeruli, the interstitial tissue, and vascular

walls being, in turn, involved. Burmeister (Virchow's Archiv, B. 137, H. 3).

4. Pregnancy may act as a cause of acute nephritis (gravidarum). In such cases it usually appears in primiparæ, in the last months of gestation, and is probably the result of renal engorgement due both to mechanical pressure and to nutritive disturbances in the kidney, owing to the altered blood-condition.

5. Latent chronic nephritis may form the cause of a manifest acute nephritis.

Pathology.—There is a considerable variation in the anatomical changes in and the appearance of the kidneys, according to the degree of involvement. Between the very mild and grave cases there is an intermediate series of continuously more marked pathological changes dependent upon the amount of poisonous material circulating in and eliminated by the kidneys, as well as upon the intensity and duration of its toxic action.

There may be no microscopical change in the mildest cases. As a rule, however, the kidneys are slightly enlarged, swelled, and somewhat softened, though these conditions are more evident when the interstitial exudation is abundant and inflammatory œdema is evident. On section the organs may appear red and congested or they may be pale and mottled. In the former case hæmorrhages may appear beneath the capsule (acute hæmorrhagic nephritis); it is more usual, however, to see red, hyperæmic patches alternating with opaque and whitish portions, both on the outer and the cut surfaces. Especially is the cortex swelled, turbid, and pale, or slightly congested in the mildest cases; in severe attacks it is deeply mottled (red and pale glomeruli) or hyperæmic. The surfaces are smooth and the capsule non-adherent. The pyramids usually show an intense-red color.

In the very mild cases, already referred to, changes may be noted microscopically that are not visible to the naked eye, there being simply a cloudy swelling or a granular (parenchymatous) degeneration of the epithelium of the Malpighian tufts, Bowman's capsule, and of the uriniferous tubules of the cortex. In the absence of exudative changes in the interstitial tissue, however, this cannot be called true acute ephritis. The acute parenchymatous degeneration may be limited almost exclusively to the glomeruli, as in some cases of scarlatina, and from this fact has arisen the term "glomerulonephritis." The muscles are either swollen or absent; the cells are swollen, opaque, and irregular in shape; and the cell-contents are granular (albuminoid or fatty). The death of the cells—owing to coagulation necrosis or disintegration, desquamation, and hyaline degeneration of masses of the cells in the tubules—marks a further stage in the process. Acute degenerative changes are frequently found in the acute infectious diseases, or when inorganic poisons have been introduced into the body. In phosphoric poisoning there may be an actual fatty degeneration of the epithelium, either proceeding from the cloudy swelling or occurring as an independent development. In severe cases a rapid necrosis of the cells is also met with.

True acute nephritis exhibits not only changes in the parenchyma (epithelium), but also an inflammatory exudate between the tubules, consisting of serum, leucocytes, and red blood-corpuscles. In some places the kidneys show only a slight cellular infiltration of the intertubular tissues. In others the interstitial tissue is swelled by the coagulated serofibrinous exudate, many leucocytes,

and some erythrocytes, besides the desquamation of necrotic epithelial cells and the presence of hyaline casts in the tubules. The inflammatory exudate collects, also, in the Malpighian bodies and tubules. The tubules may be dilated and choked with degenerated cells, or more frequently the straight tubules are clogged with hyaline casts. The lining epithelium, especially in the convoluted portion of the tubules, is often flattened. The white blood-corpuscles infiltrating the stroma of the kidney are collected in foci in the cortex, and not, as a rule, equally diffused.

The outlines of the individual capillaries are lost, and the glomerular epithelium of the capsule—especially that covering the inside of the capillaries of the tufts—is swelled and opaque. New epithelium appears in most instances of diffuse exudative nephritis, and a restoration of the glomerular function occurs. According to Delafield, in the productive variety of acute diffuse nephritis, however, certain lesions are more permanent in character from the outset in the glomeruli and stroma, and hence the increased gravity of the disease. Superadded to the usual exudative condition are the following changes: (*a*) a growth of the cells lining the capsules, such as to form a mass that compresses the tuft, "and leading, finally, to obliteration of the vessels and fibroid glomeruli"; (*b*) a growth of the connective tissue parallel to, and surrounding, one or more arteries having thickened walls, and forming more or less numerous and regular strips or wedges in the cortex. The new tissue between the tubules is, in the more intensely acute cases, largely cellular; in those of a subacute type it is relatively dense and fibrous.

Pleural, pericardial, and peritoneal dropsy, as well as anasarca, are also found in those dying of acute Bright's disease. Meningitis, cerebral œdema, and lobar pneumonia are also sometimes seen post-mortem.

Diagnosis.—Acute Bright's disease can hardly be overlooked when the urine is carefully examined chemically and microscopically. The eclampsia of pregnancy can, however, be recognized only by repeated examination of the urine, especially during the last months of pregnancy.

> Six cases of pregnancy, with Bright's disease. Two forms recognized: one hyperacute, absence of premonitory symptoms, chiefly attacking primiparæ, with no diminution of urine and no massive albuminuria, producing convulsions and bringing about the death of the fœtus; the other in older women, the prodomata lasting weeks or months; characterized by increase in the quantity of urine and less severe albuminuria; may be unaccompanied by convulsions and very often become chronic. Hermann (Brit. Med. Jour., Jan. 13, '94).

> Case of subacute nephritis subsequent to an attack of simple herpetic tonsillitis. On the fifteenth day an eclamptic crisis suddenly set in, accompanied with anuria. Urine contained 1 ¼ drachms of albumin per quart. The crises became more frequent, coma set in, and the patient died with broncho-pneumonia. Histological examination of the kidneys showed, on the tubular epithelia, an immediate lesion with cloudy tumefaction and coagulation necrosis. Siraud (Revue Inter. de Bibliographie, Apr. 25, '94).

Acute Bright's disease should be suspected, and the urine examined, in every case showing pallor of the skin and puffy eyelids, whether general prostration of the health is apparent or not. The characteristic symptoms of acute exudative nephritis, as commonly seen when the condition is due to cold or occurs in scarlet fever, are the following: Headache, restlessness, muscular twitching,

nausea and vomiting, a tense pulse, moderate fever, dropsy, and anæmia. Tube-casts and albuminuria are constant. It should be borne in mind that slight albuminuria occurring in the course of pregnancy or during any of the fevers, without casts, is not a true nephritis, although the latter may be a more or less remote consequence of the glandular degeneration of the renal epithelium associated with the febrile albuminuria. In addition to the presence of albumin and hyaline and cell- casts, however, a diminished quantity of sooty-looking urine and the discovery of red and white blood-corpuscles will render the diagnosis positive. The history of the case and the causal factors are also to be taken into consideration.

Prognosis.—A case of ordinary exudative nephritis following exposure to cold and wet runs a course varying from a few days to three or more weeks. There is a steady diminution of the albuminuria, which finally disappears together with the casts, while the daily quantity of lighter urine and the daily excretion of urea increase. The character and intensity of the renal inflammation, and the primary disease or causative conditions largely determine the prognosis. Scarlatinal nephritis gives much less hope of recovery than does nephritis due to exposure to cold after alcoholic excesses. Recovery usually takes place easily after the acute parenchymatous degeneration that accompanies diphtheria, typhoid, and other infectious fevers, as well as pregnancy. In acute yellow atrophy, however, and in yellow fever, cholera, severe phosphoric or mercurial poisoning, death may occur from the intense and widespread necrosis of renal epithelium. The dropsy and albuminuria gradually diminish in favorable cases of ordinary exudative nephritis, while the color of the skin and the quantity of urine and urea increase; so that recovery is established in from three to six weeks. The albumin may persist for some time after the disappearance of the dropsy, and then gradually disappear; rarely, however, in unfavorable cases, albuminuria may continue and the affection become chronic parenchymatous nephritis, even after the dropsy has disappeared.

Acute nephritis presents a number of serious and often dangerous symptoms. Among these are severe general œdema, dropsical effusions into the serous sacs (as hydrothorax), uræmia (especially when beginning with cerebral manifestations, as convulsions or coma), and, finally, inflammation of the internal organs, as pneumonitis, pleuritis, pericarditis, peritonitis, and meningitis. Recovery is quite common in cases of marked general dropsy in the absence of uræmia. Suppression of the urine, however, if it last more than twenty-four or forty-eight hours, is usually a fatal symptom. In those cases, also, in which the nephritis has a productive character, the prognosis is unfavorable, though life may, in some cases, be prolonged for several years.

A simple nephritis may be cured entirely or, as very frequently occurs, but partially. In these cases a limited, localized nephritis remains and which is persistent in spite of all treatment. A deformity; not an actual developing disease. Cuffer and Gaston (Med. News, Feb., '91).

Literature of '96-'97-'98.

Case of acute Bright's disease ending fatally in seventeen days in a child. 3 months old, and not consequent upon a skin affection or scarlatina. T. B. Greenley (Amer. Pract. and News, June 15, '98).

Treatment.—The first object in the

treatment is to relieve the congestion and inflammation, since the renal function is diminished by these conditions; by these means we restore the excretory function. It is, therefore, in order to restore the functional equilibrium by their antiphlogistic influence, that the single or combined use of diaphoretics and cathartics is employed, and not that the skin and bowels should be made to perform the work normally done by the kidneys.

Absolute rest in a warm bed and in a warm room is of primary importance, and, in order to promote a constant and free action of the sweat-glands, woolen underwear and blankets should be used. These measures are of importance both in mild and severe cases.

The diet should consist of bland liquid foods only, and the patient should be urged to drink freely of water (plain, distilled, or carbonated), lemonade, skimmed milk, or butter-milk, all of which are of especial value when hot. Thin meat broths may be allowed later in the course of the disease, although a strict milk diet is preferable.

In rare cases in which there is severe pain, local blood-letting, by means of leeches or cupping over the loins, may be useful; these measures are seldom needed, however, and a more salutary effect may often be gained by hot fomentations. Diminution of the œdema and the elimination of urea and other urinary constituents retained in acute nephritis are best attained by exciting a profuse perspiration. The congestion of the kidneys is also relieved by this vicarious action of the skin. The same results may also be accomplished by means of the hot-air or hot-water bath and the hot wet pack; in most cases the last method proves effective. It is easily applied by wringing a blanket out of hot water, wrapping the patient in it, and surrounding him, first, with a dry blanket and, finally, with a rubber cloth. According to the condition the patient may remain in this improvised steam bath until free sweating has continued for an hour or more. Children suffering from scarlatinal nephritis may either be treated thus, or by immersion in hot water for twenty, thirty, or more minutes; the child is then wrapped in warm sheets or blankets, after lightly drying the skin, and warmly covered in bed. Hot air or vapor may also be generated beside the bed and introduced beneath the cradled bed-clothing by means of a tin funnel and pipe. The drinking of hot lemonade or soda-water, or of water containing spirit of Mindererus, will stimulate the sweating. Should these measures fail, as in uræmia, perspiration may be started by an hypodermic injection of pilocarpine, $^1/_8$ to $^1/_6$ grain; it will then continue to pour out upon the application of heat. Serious consequences sometimes attend the use of pilocarpine, and the heart and pulse must always be carefully watched. The sweating should be repeated as often as the patient's strength will permit, until the dropsy disappears.

Literature of '96-'97-'98.

The depression of the heart's action produced by pilocarpine is very similar to that caused by nicotine. The toxic effects of the drug are best overcome by atropine. Where toxic effects result from the administration of pilocarpine, the ordinary circulatory stimulants should also be resorted to. Probably the only cases in which pilocarpine could be used with safety are those in which there is simple hypertrophy of the heart, with a strong action. The contractive power of the heart is what should be depended upon as a guide. Its employment is certainly contra-indicated if there is any dullness over the lungs, or pneumonia,

emphysema, pleurisy, coma, fatty degeneration of the heart, or cardiac insufficiency. To ascertain the condition of the cardiac muscle, auscultation with the binaural stethoscope is called for, and any impairment of the first sound of the heart should make one hesitate to use pilocarpine. C. J. Proben (Med. News, Aug. 1, '96).

Pilocarpine liable to produce a kind of bronchorrhœa which is almost always fatal. Case seen in consultation of a child, 2 years of age, who had recently had scarlet fever. The attack was not a severe one, but it was followed by kidney disease, which resulted in general anasarca. A single dose of pilocarpine was administered, and as a result of this bronchorrhœa was rapidly produced, accompanied by the most intense dyspnœa, so that the patient soon succumbed. Other cases seen, however, in which the remedy acted with the most happy effect. J. Lewis Smith (Med. News, Aug. 1, '96).

While pilocarpine is a dangerous remedy, which should always be used with great discrimination, bad effects never personally observed from its use; only from $^1/_{12}$ to $^1/_6$ grain administered, however, usually combined with some cardiac stimulant, such as strychnine or digitalis. J. Blake White (Med. News, Aug. 1, '96).

External application of pilocarpine in the dorso-lumbar region, employing an ointment of 3 ounces of vaselin and from $^3/_4$ grain to $1\,^1/_2$ grains of pilocarpine nitrate. Surface frequently covered with a layer of cotton, which is allowed to remain on during the day. Out of eighty cases, the acute were rapidly restored to health and chronic cases were improved. There was marked diaphoresis and diuresis and albumin often disappeared from the urine. Julia (Lyon Méd., Dec. 6, '96).

Hydragogues, as elaterium, the saline cathartics, and compound jalap powder are useful as adjuvant measures. The extract of elaterium ($^1/_6$ to $^1/_4$ grain) is prompt in action, and magnesium or sodium sulphate (1 drachm) given in hot concentrated solution every hour, or a calomel purge, may also be recommended. In extreme cases of dropsy it may be necessary to relieve the tension and distress by the use of a small trocar and cannula, with a drainage-tube (Southey) attached to the latter after the trocar is withdrawn, or by multiple punctures. If either hydrothorax, hydropericardium, or ascites assumes serious features, aspirations will become necessary. To the diaphoretic treatment may be added $\frac{1}{2}$-ounce doses of the spirit of Mindererus in water. This, combined with aconite, aids in controlling the fever that may be present and in preventing the vasoconstriction that is often premonitory of uræmic symptoms.

If the uræmic convulsions do not promptly yield to diaphoresis and catharsis, venesection must be resorted to, the withdrawal of as much as a pint or two of blood often saving life. Occasionally inhalations of chloroform are needed to subdue the violent convulsive seizures, as in eclampsia. Their recurrence may be prevented by the use of rectal injections of potassium bromide (1 drachm) and chloral ($\frac{1}{2}$ drachm).

Contraction of the arteries with increased tension and beginning muscular twitchings require the use of chloral hydrate, nitroglycerin, and, possibly, morphine.

Nausea and vomiting may be held in control by minute doses of cocaine, cracked ice, dilute hydrocyanic or hydrochloric acid, bismuth, or by the addition of soda- or lime- water to the milk.

There is little advantage in diuretics other than the simple diluent drinks already mentioned, at least early in the course of the disease. Later, potassium bitartrate or acetate, sodium benzoate, as adjuvants to the water, and stimulants to relieve cardiac depression, or caffeine citrate and the infusion of digitalis, may be given, well diluted.

Literature of '96-'97-'98.

In infectious nephritis of young subjects, with or without anasarca, tincture of cantharides in doses of 10 to 12 drops is very beneficial. It is contra-indicated in the interstitial nephritis of arteriosclerosis and in lead poisoning. Mlle. A. Myszynska (Thèse de Paris, No. 24, '96).

Care must be taken during convalescence that the patient be not exposed to cold. The diet must not be changed to solids either too suddenly or too rapidly, and particularly does this rule hold in the matter of meats. Milk should form the mainstay of the dietary, and light watery vegetables, fruits, and cereals may be gradually added. The anæmia will indicate the ferruginous tonics.

Literature of '96-'97-'98.

The fatal result is reached in many cases only because the rigid course of management necessary to stem the progress of the disease is not enforced until irreparable mischief is done to the kidneys. The patient should avoid fatigue, mental wear, errors in diet, exposure to cold or damp, and keep the skin thoroughly protected. The urine should be examined at stated periods (monthly) to ascertain whether any trouble is still lurking or has been redeveloped. Jacob Price (Med. and Surg. Reporter, Apr. 24, '97).

Carefully regulated habits in regard to dress, exercise, and diet, and a change to a warmer, drier, and more equable climate, are necessary in cases that are convalescent from the very serious forms of nephritis, in which the renal parenchyma, by the persistence, at intervals, of a slight albuminuria, is shown to have been somewhat damaged.

When acute or subacute attack appears, more or less long sojourn in bed, patient lying between blankets. Warm climate, but not on or near the sea. Brushing of skin, but no baths, lest patient take cold. Moderate exercise or massage. Pregnancy contra-indicated; sexual sobriety important. Milk the food and medicine *par excellence*; 2 quarts daily need not be exceeded. When marked improvement, vegetarian diet. Purgatives and diuretics only remedies needed, and caffeine subcutaneously if heart show signs of failure. Sapelier (Bull. Gén. de Thér., Nov. 30, '94).

Hot baths and milk diet best measures. Diuretics useless. Though calomel acts as such, stomatitis is difficult to avoid. Repenak (St. Petersburger med. Woch., Apr., '95).

In acute nephritis in children, rest in bed and strict milk diet; from one to two scarified cuppings on each side of the spine, with mustard plasters; every two hours $2\frac{1}{2}$ drachms of benzo-naphthol and $2\frac{1}{2}$ drachms of milk-sugar in an effusion of cherry-stalk; morning and evening cold boiled-water enema; once or twice a week julep and scammony; dry friction of the body, and asepsis of the mouth. Perier (Jour. de Méd., Apr. 29, '94).

Puncture of the kidney has recently been recommended.

Literature of '96-'97-'98.

Puncture of the kidney to relieve tension and cause cessation of albuminuria. Exploration of the kidney had been undertaken to discover if there were a co-existing morbid condition present. Good results followed and appeared inexplicable. They were thought to be due to such factors as the division of a nerve, the moral effects of the operation, etc. After several cases showed the same results, a different explanation became necessary. In three subsequent cases, one of scarlatinal nephritis, one of nephritis from exposure to damp and cold, and one of nephritis following influenza, the albumin disappeared from the urine directly after surgical treatment; it was, therefore, believed that the albuminuria was due to a state of tension in the kidney, which was relieved by the operation. In a proportion of cases of nephritis albuminuria disap-

pears; in others it is very persistent. It is in these that surgical exploration of the kidney is indicated. This is particularly the case when the kidney complication is grave from the outset and there is more or less suppression of the urine, and when, after a limited time, the renal symptoms do not tend to disappear. The operation of exploration is so safe that it is justified in all severe renal disorders. "The kidney should be exposed by a moderate incision from the loin, so as to enable the operator to feel the organ distinctly both in front and behind, aided, of course, by pressure exercised on the kidney by the hand of an assistant from the front of the abdomen. If, in conjunction with the presence of albumin in the urine, the kidney is found in a state of tension, such as I have illustrated, three or four punctures may be made through the capsule in various directions; or, should the organ be found in a state of higher tension, then a limited incision into the cortex may be practiced. After one or other of these measures has been executed, the wound should be lightly packed with gauze or a drainage-tube substituted. In either case the incision should be dressed in such a manner as to provide for the free escape of either blood or urine or whatever products may be exuded." Reginald Harrison (Med. Weekly, Oct., '96; Med. Record, Nov. 7, '96).

Exudative Chronic Nephritis.

Definition.—A chronic diffuse inflammation of the kidneys, attended with epithelial degeneration, exudation from the blood-vessels, and permanent connective-tissue changes in the renal stroma. This is one of two varieties of chronic Bright's disease, and is identical with Delafield's chronic productive (or diffuse) nephritis with exudation.

Symptoms.—The symptoms of an acute parenchymatous nephritis may persist in a lesser degree until the condition becomes a chronic one; particularly is this true of the albuminuria, the anæmia, and the dropsy. As a rule, however, the disease develops slowly and gradually, and in a subacute manner, although there is seldom an early indication of renal derangement. There may be merely a loss of appetite, attacks of indigestion, nausea, headache, dullness, perhaps some pallor, and a general impairment of health and strength. The complexion then takes on a blanched appearance and there is soon puffiness of the eyelids or swelling of the feet or ankles, or both. There is a gradual extension of the œdema up the legs, and as the day grows it becomes worse; on rising in the morning it may have entirely disappeared. In the majority of cases the quantity of urine is diminished. In the later stages of the disease, however, it may be nearly or quite normal, and in protracted cases of pale contracted kidney, or when absorption of the dropsical effusion is in progress, it may even be slightly increased.

An acute nephritis supervening upon the chronic condition may now cause a very scanty or suppressed secretion of urine. In cases of scanty urine the specific gravity is, of course, increased, and *vice versâ*. Albuminuria is often present to a decided degree. The albumin may constitute from one-fourth to three-fourths of the urine in volume, or from 1 to 3 per cent. by weight; thus the daily loss of albumin may be considerable.

The clinical significance of albuminuria as a symptom has undoubtedly diminished during the last twenty years. Cases of "functional" albuminuria constitute from one-half to one-third of all the cases of albuminuria that come under notice. Ralfe (Brit. Med. Jour., Feb. 20, '93).

Certain cases of Bright's disease may exceptionally, and sometimes for a rather long period, show no albumin in the urine; but, there may sometimes be renal insufficiency without serious renal

lesions. Too often a case is diagnosed as a contracted or enlarged waxy kidney, when the autopsy shows but slight lesions; diagnosis should only have been renal insufficiency. Lépine (Lyon Méd., July 9, '93).

Six cases in which autopsy showed the presence of Bright's disease, and in which the urine, carefully examined during life, showed, at certain times, no albumin, although symptoms of uræmia were present. These observations, together with similar ones of Lépine, Lancereaux, and others, tend to show that albuminuria is not always a faithful symptom in nephritis. Dieulafoy (Bull. de l'Acad. de Méd. de Paris, June 6, '93).

The albuminuria of Bright's disease is always characterized by great oscillations in the quantity of albumin excreted at different hours of the day, because either of the richness of alimentation in nitrogenous substances or of causes that escape us and should be classed among hæmatogenous albuminurias. Semmola (Inter. klin. Rund., Jan. 17, '89).

In many instances where those authorities claim to obtain an albuminous reaction in normal urine they are really dealing with mucin. Plosz (Orvosi Hetilap, Nos. 42 and 43, '90).

There is a non-albuminuric nephritis exclusive of the cases of typical fibroid kidney. In this form of nephritis albuminuria may be completely absent, while signs of renal insufficiency, and even uræmia, may appear. The urine is diminished and sometimes highly colored, but there is no cardiac weakness. Stewart (Med. News, Apr. 14, '94).

No albumin is to be found in the urine in some cases of nephritis. Such a nephritis may be due to the introduction of a specific virus from the external genitals. Fienga (N. Y. Med. Record, Apr. 21, '94).

Presence or absence of albumin in the urine is not nearly of as much diagnostic and prognostic importance as the morphological evidence of kidney disease afforded by the presence or absence of casts. Ludwig Bremer (Med. Review, June 29, '95).

Casts are invariably present when a true organic lesion exists. Cardiovascular tension is another symptom almost invariably present in the early stages of renal cirrhosis. Occipital headache, with momentary attacks of vertigo, is rarely absent. In addition, there is usually a somewhat ill-defined appearance of want of perfect health, restless movements, coated tongue, foul breath, pale lips, and lifeless or waxy appearance of the skin. Danforth (N. Y. Med. Exam., Aug., '93).

Albuminuria is absent in the interstitial forms, while the skin is frequently dark in color in the parenchymatous forms. Dabney (Inter. Med. Jour., Nov., '93).

Rapid elimination of such substances as iodide of potassium, quinine, turpentine, and the bromides shows that the kidney is healthy, while delayed or diminished elimination gives sufficiently precise information as to the degree to which the organ is affected. Bassett (N. Y. Med. Record, Apr. 21, '94).

The quantity of urea is much diminished. The urine contains an abundant sediment, consisting of urates, casts, red and white blood-corpuscles, epithelial cells, granular *débris*, and fatty granular cells, and is in color turbid and sometimes smoky-yellow. There are tube-casts of different varieties, the narrow or broad hyaline, fatty granular, and epithelial casts being most commonly noted.

The œdema is prominent and persistent, gradually extending all over the body; thus pitting may be obtained on pressure on the limbs, chest, abdomen, and back.

The loose subcutaneous tissues, as of the penis, scrotum, and eyelids, are especially distended. Only in chronic hæmorrhagic nephritis may the œdema be absent or very slight. Chronic exudative nephritis, especially with large

white kidney, shows a pasty, pallid skin and anasarca as its most distinguishing characteristics. For several months the dropsy may be of moderate degree and almost stationary; it then grows worse insidiously, in spite of all efforts at treatment, and death ensues in a month or two.

Case in a man, 50 years of age, in whom œdema had occurred in various positions,—face, hands, feet, and scrotum. At one time he was rather suddenly seized with severe attack of dyspnœa, due to an œdema of the pharyngeal walls and those of the upper part of the larynx. In the course of several days, under the use of a spray of carbolic acid and an absolute milk diet, the œdema disappeared. Mendel (Ann. des Mal. de l'Oreille, etc., May, '91).

A large number of cases in which œdema of the glottis was the only symptom of Bright's disease localized in the larynx. Occurs as an incident in the course of the disease or as the initial symptom of latent Bright's disease. Twelve such cases recorded. It may lead to death in several hours. Maire-Amero (Ann. des Mal. de l'Oreille, etc., Mar., '94).

Form of œdema which is to be excluded in the consideration of the symptoms of Bright's disease. It is superficial in persons free from any traces of albuminuria and unaffected by any alterations of heart or lungs. In none of the cases met has the author been able to establish any relation with the hæmic condition, as in chlorosis. The administration of iodide of potassisum having led to rapid disappearance of the œdema from four cases, the phenomenon ascribed to some syphilitic affection of the vasomotor system. Tschirkow (Meditzinskoje Obozrenije, No. 2, '91).

There may be present in serious cases dropsy of the serous sacs, with its accompanying distressing symptoms; œdema of the larynx and lungs may then supervene, causing sudden death. Dyspnœa may occur, both toxic and nervous, as well as mechanical or cardiac, in origin. On lying down, cardiac dyspnœa, due to failure of the heart's action and seen in many instances, is aggravated, as a rule.

Dyspnœa of uræmia is divided into three forms: simple, characterized by acceleration of respiration and diminution of the fullness of respiration; paroxysmal, or Cheyne-Stokes, in which a period of apnœa alternates with one of dyspnœa of regularly varying fullness and the spasmodic, which closely simulates spasmodic asthma. Lancereaux (Jour. of Nerv. and Mental Dis., May, '91).

Attention called to the many similar features between the dyspnœa of Bright's disease and that from accepted cardiac origin,—the breathlessness on even slight exertion, the distressing paroxysms at night, the influence of the horizontal position in increasing the severity, and the fact that Cheyne-Stokes respiration is not infrequent in either. Steell (Med. Chron., Oct., '91).

Particular attention to the high arterial tension in cases of chronic Bright's disease, and to the renal inadequacy and retained substances as an important factor in the etiology of the symptom. Musser (Times and Register, Oct. 17, '91).

In many instances there is too great a tendency to regard as cardiac a toxæmic dyspnœa. In such cases of dyspnœa, where no auscultatory symptoms are present, even if the urinary phenomena are not calculated to impress very strongly the fact of a decided renal alteration, the possibility of uræmic origin should be gravely considered. Several instances where the withdrawal of cardiac stimulants and morphia, given with a view of correcting a cardiac error, and the substitution of remedies and measures for the correction of a toxæmia, were followed by a successful result. Landouzy (Jour. de Méd. et de Chir. Pratiques, Aug. 10, '91).

[It has long been believed that the dyspnœa of advanced Bright's disease is

of toxæmic origin, and so it probably is in a number of instances; at least, in a certain degreee. But, aside from the direct action of the toxic retention substances upon the respiratory centres or upon the respiratory tissues, there must be remembered the circulatory element. ALLEN J. SMITH, Assoc. Ed., Annual, '92.]

It may be provoked by vasoconstriction, and is, in such cases, a signal of uræmia.

Form of uræmia which manifests itself in the mouth and pharynx,—bucco-pharyngeal uræmia. Marked by the presence in the mouth and pharynx of a thick, gummy mucus, covering the walls of these cavities. When it is detached the membrane beneath is red and dry, but not ulcerated, although the similarity to a pseudomembranous formation is close enough to mislead the incautious. It is not infrequently accompanied with hiccough, bulbar dyspnœa, and other cerebro-spinal phenomena, and presents a number of analogies to vomiting known to be of central origin. Lancereaux (Sem. Méd. and Gaillard's Med. Jour., Mar., '91).

With these conditions may be associated catarrhal bronchitis, with cough and expectoration.

There is frequently a moderate degree of cardiac hypertrophy of the left ventricle; later there are dilatation and weakness of both ventricles. There is an accentuation of the aortic second sound and an increase of the pulse-tension.

Headache, vertigo, sleeplessness, nausea and vomiting, diarrhœa, and stupor, coma, or delirium may all develop and form the symptoms of a uræmic condition.

These symptoms, as a rule, precede a fatal termination. The convulsions that are common to chronic nephritis without exudation do not appear, however. In quite a large number of cases albuminuric neuroretinitis occurs, and is evidenced by dimness of vision and field-defects. In certain cases of marked œdematous distension the skin of the legs becomes subject to a red eczematous eruption. The temperature is practically normal in the absence of such complicating inflammations as pericarditis, endocarditis; pneumonitis, and ulcerative colitis, all of which are rare conditions.

Chronic exudative nephritis may either continue from bad to worse, and death may end all in a year or two, or anæmia, albuminuria, and dropsy may appear in a person that has, for years previously, enjoyed apparently good health. After a first attack a second proves fatal within a few months. On the other hand, certain cases may show a slight pallor, a slightly diminished quantity of urine of high specific gravity, and containing albumin, and yet may complain of no inconvenience for years. Decided attacks may then occur at intervals, during which the dropsy, dyspnœa, etc., may be absent, although a certain amount of albuminuria persists; these attacks last for several months. The average duration of the disease varies from one and one-half to three years.

Etiology.—Chronic nephritis with exudation may either follow acute diffuse nephritis (as of scarlet fever or pregnancy), or simple chronic congestion and chronic degeneration of the kidneys. It arises insidiously more frequently, however, and without any previous acute manifestation. Males are more subject to this form of chronic Bright's disease than females. Cases occurring in children are usually preceded more or less recently by scarlatinal nephritis. Young adults, however, are more commonly affected with the usual form, developing

subacutely. Beer-drinkers, and those who are accustomed to using malt and alcoholic intoxicants, seem especially liable to the disease. Even in cases where other manifestations are absent, it is not improbable that, in the insidious cases, some toxic or infectious agency may act slowly and persistently, and be the cause of the nephritis.

The disease has been observed in certain individuals living in malarial regions, and persons working under an exposure to cold and wet, or living in humid, marshy districts, seem more liable to the renal malady than those who are more carefully shielded from such influences.

A form of chronic albuminuria of less prognostic importance is that associated with chronic malaria. This is probably due to venous congestion during the attacks of ague. Lauder Brunton (Brit. Med. Jour., Feb. 20, '93).

Three cases of nephritis following malarial fever, in which the symptoms, including albuminuria, disappeared on the administration of quinine. Stephanowicz (Wiener klin. Woch., No. 20, '93).

Cases of parenchymatous degeneration of kidney, proven by autopsy, in which the causative element was chronic malarial infection. A. Gray (Jour. Ark. Med. Soc., Dec., '94).

Case of nephritis in which ordinary treatment gave no result. A characteristic access of ague pointing to etiology, large doses of quinine caused rapid improvement. Bermann (N. Y. Med. Rec., Dec. 23, '94).

Acute form less frequent among soldiers in Algeria and Tunis than in France, showing the influence of temperature as cause; while the reverse is the cases as regards the chronic form, pointing to effect of malaria in the etiology of Bright's disease. Famechon (Archives de Méd. et de Pharm. Militaires, Jan., '95).

Case of acute nephritis from cold attended by an erythematous rash and extensive desquamation. Waldo (Brit. Jour. of Derm., Apr., '95).

This so-called "parenchymatous" form of chronic Bright's disease may find its cause in tuberculosis, syphilis, or chronic suppuration, and in such cases it is usually combined with amyloid disease (waxy degeneration).

Epithelial nephritis may follow in the course of syphilis, tuberculosis, and leprosy, and which are quite distinct. It begins suddenly, as does subacute nephritis, but its progress is slow. The urine is not abundant, is strongly albuminous, and the prognosis always grave on account of the danger of uræmia. Lancereaux (Le Bull. Méd., Jan. 11, '93).

Case developed suddenly without usual causes, during secondary period of syphilitic infection. Thiroloix (Concours Méd., July 13, '95).

Syphilis may lead to a nephritis rebellious to treatment. Dieulafoy (Bull. de l'Acad. de Méd. de Paris, June 20, '93).

Pathology.—There are several types of kidney included in this disease, yet in all the changes of structure are essentially identical, and the variations, when they occur, depend upon the cause and duration of the nephritis.

The large white kidney (without waxy degeneration) may be either normal in size or enlarged, and is pale or yellowish in color. The surface is smooth and the capsule is easily stripped off. On section the cortex appears broader than normally, and is either yellowish white throughout or may present opaque yellowish or whitish areas with mattings of red. In some cases the pyramids are congested. The following changes may commonly be observed microscopically: The renal epithelium is swelled, hyaline, granular, or fatty, and is more or less disintegrated or flattened; there is

an enlargement of the glomeruli, owing to the growth of the capsule-cells and of the cells covering the capillaries; and, in certain cases, as a result of the connective-tissue thickening of the capsule, the tuft of capillaries is atrophied. There is some thickening of the arterial walls, and a moderate growth of connective-tissue may be noted in patches around the glomeruli and tubules. The latter contain hyaline and granular casts.

The small white kidney (secondary contracted kidney) is, in most instances, probably a later stage of the preceding condition, in which the epithelial degeneration becomes more pronounced, and the connective-tissue growth and the resultant cicatricial contraction become prominent features. The kidneys are about normal in size; owing to a shrinkage in the large white kidney, the surface is slightly granular and the capsule proportionately adherent. In color they are usually grayish or yellowish (pale granular), and there may be a certain amount of red mottling. The consistency is firmer than that of the large white kidney, and the surface, on section, shows, in the somewhat narrowed cortex, yellowish-white foci of fatty-degenerated epithelium; hence the term "small, granular, fatty kidney." Microscopically we find extensive degeneration and disintegration of the epithelium of the glomeruli and convoluted tubules, atrophy of the parenchyma, and a corresponding increase in the interstitial connective tissue. There may be an associated waxy degeneration.

The large red or variegated kidney of chronic hæmorrhagic nephritis forms a third variety. The kidneys are found, as a rule, enlarged, red, swelled, and congested-looking or mottled; frequently they are "bumpy," or slightly bosselated. The capsule is slightly adherent to the depressions between the bosses. The section shows congested portions and gray or yellow spots corresponding to the anæmic and fatty-degenerated portions. Red spots, due to small hæmorrhage, may also be noticed on both the outer and cut surfaces of the kidney, and small cortical hæmorrhagic areas or striations, brownish-red in color, are distinctive. Microscopically the appearances are those of acute nephritis superadded to those of the large white kidney, and consist of fatty granular degeneration, epithelial proliferation, atrophied capillary tufts, thickened glomeruli capsules, and, in some places, a growth of interstitial fibrous tissue. In either place inflammatory œdema and cellular infiltration of the intertubular tissue may be noted, as well as the dilated tufts of capillaries with surrounding cellular hyperplasia. This variety of chronic nephritis is frequently seen in inebriates.

Prognosis.—The prognosis is invariably bad, though life may, in certain cases, be prolonged. Death may occur in severe cases in from three months to a year, from uræmia, dropsy, dilatation of the heart, or from other complications. Cases of a year's duration seldom recover, and those in which advanced secondary contraction of the kidney may be assumed may be considered hopeless; they often terminate suddenly. Rarely there may be a complete recovery; this occurs particularly in children following an attack of scarlet fever. According to the quantity of urine passed in the twenty-four hours, and the amount and persistence of the albumin, is the prognosis made, as well as upon the degree of cardiovascular and retinal changes. Relapses may occur in apparently favorable cases, and acute attacks may supervene.

Treatment.—This is conducted much as in acute nephritis. The uræmia and dropsy are treated symptomatically. The diet is of great moment, skimmed milk and buttermilk being depended on as much as possible when the dropsy is marked. When the dropsy is slight, more solid food, white meats, vegetables, and fruits, and an out-door life should be recommended. Prolonged, sudden exercise and severe exercise should be prohibited.

Importance of combating the tendency to anæmia, the prognosis remaining good as long as this condition is averted. Stephen Mackenzie (Brit. Med. Jour., Feb. 20, '93).

Woolens should be worn next to the skin, and residence in a warm, dry climate may aid in extending life.

Nitroglycerin may be needed in cases with contracted and tense arteries, with a tendency to uræmic twitchings, and digitalis may be useful in cardiac weakness. Basham's mixture for the anæmia and unirritating diuretics will prove of value, and strontium lactate, in doses of from 15 to 20 grains, three or four times daily, may be tried in some cases.

Lactate of strontium is beneficial, in a large number of cases, when sclerosis has not begun. It produces nausea in powder, but not when dissolved in water, 1 to 6 parts, three or four tablespoonfuls being given daily. Ried (Med. and Surg. Reporter, Jan. 26, '95).

Child, 5 years of age, who suffered from chronic Bright's disease and whose urine contained large quantities of serum-albumin and globulin. Lactate of strontium increased the quantity of urine and solids excreted and the patient rapidly recovered. Gillespie (Med. Chronicle, Sept., '94).

Three cases of nephritis treated by lactate of strontium; an excellent diuretic in the acute forms and in acute attacks occurring in the course of the chronic form. Da Costa (Med. News, Apr. 21, '94).

Literature of '96-'97-'98.

Lactate of strontium tried in 10 cases of Bright's disease,—3 of acute parenchymatous, 6 mixed, and 1 interstitial. The favorable action of salts of strontium on the kidneys is not due to their diminishing putrefaction in the intestines. Direct experiments with bacteria showing that the antiseptic properties of lactate of strontium are insignificant, and that the presence of ethereo-sulphuric acids in the urine are not influenced by the use of the drug. Bronowski (Medycyna, No. 1, '96).

There is a great deal of mischief done by iron in Bright's disease. It may be laid down as a rule to which there is almost no exception that the iron is not indicated, and should not be prescribed, in cases of acute Bright's disease. On the other hand, after the acute symptoms have passed away and convalescence sets in, iron is very useful. A second class of cases in which iron is contra-indicated is chronic interstitial nephritis, in which it is more promptly and dangerously harmful than in any other form of Bright's disease. The form of Bright's disease in which iron is best borne is chronic parenchymatous nephritis. The proper dose should be determined by an examination of the stools, and, if these are decidedly blackened, too much is being given. Basham's mixture is no more diuretic than the bulk of water which constitutes its menstruum. James Tyson (Journal Amer. Med. Assoc., July 23, '98).

Methylene has also given satisfaction in some cases.

Literature of '96-'97-'98.

Methylene-blue is recommended in chronic nephritis. Dose from 3 to 5 grains a day. Man of 58 years, suffering from chronic Bright's disease with renal congestion and albuminuria, was admitted to the hospital. On the 25th of February he was passing six grammes of albumin a day. He was given a modified milk diet and treatment with alkalies and tannin. Shortly afterward he was placed upon methylene-blue in dose of 4 grains a day. On the 3d of March he was passing four grammes of albumin;

four days later he was passing two grammes; and on March 10th he was passing 20 grains. Lemoine (Jour. des Praticiens, May 22, '97).

Non-exudative Chronic Nephritis.

Definition.—A chronic diffuse inflammation of the kidneys, indicated by a growth of connective tissue in the stroma, degeneration and atrophy of the renal parenchyma, and by marked changes in the cardiovascular system.

Symptoms.—The symptoms may remain latent for a considerable time, even for years, while the morbid productive changes are gradually effected in the kidneys. They may not become evident until late in life, even though the kidneys may be in an advanced state of degeneration. Some complicating condition may also supervene, as pericarditis or pneumonia, causing the development of grave renal symptoms. As a rule, however, uræmia makes its appearance with headache, stupor, or convulsions, dyspnœa, nausea and vomiting, and a tense pulse. This seizure may be recovered from. There is now an *interim*, of variable duration, in which there are drowsiness, lassitude, a disordered digestion, headache, failing vision, dyspnœa, and frequent micturition, with a more or less impaired general health. Then follows another uræmic seizure, still more severe, if not fatal. If not fatal, the general health is still more reduced, and confinement to the house or bed is necessary; at last the vital forces can no longer compensate for the destruction of the renal parenchyma. Contracted kidney may sometimes first be manifested by spasmodic dyspnœa (uræmic-cardiac). There is a marked gradual onset of periods of drowsiness during the day that are uncontrollable; an attack of hemiplegia may be the first sign of the disease. In other cases a progressive loss of flesh and strength, with a dry, harsh, wrinkled skin, may be, from the beginning, the only clinical features, until death results from sheer feebleness and emaciation. The variability and involvement of the symptoms render it advisable to describe them under the various systemic divisions.

There is an increase in the daily quantity of urine excreted so great that it causes a frequent desire to micturate, not only during the day-time, but two or three times through the night. This may be aggravated by the hyperacidity of the urine and by the irritability of the prostate gland (especially in advanced years) that are so often associated with renal cirrhosis. The total quantity of urine for the twenty-four hours may measure several quarts in marked cases of the disease. It may be slightly decreased early in the attack, when the degeneration and destruction of the parenchyma are in their incipiency; but, as the "blood-flow to the parts that remain must, *cæteris paribus*, be as great as it would have been to the whole of the organs if they had been intact," excessive pressure is brought to bear within the capillaries, owing to the compensating cardiac hypertrophy, and the secretion of the urine, especially of the watery elements, becomes more active. Diabetes may be suggested by the polyuria, but the urine is clear and pale-yellow in color, the specific gravity being seldom above 1010 or 1012, and it may be as low as 1002 or 1005. Albumin occurs in traces only, or may even be absent altogether (glomerular atrophy); this is noted especially in the urine voided in the early morning. The urea is diminished, and there is little or no sediment. On careful examination, microscopically, there may be found a few casts (usually narrow hyaline), perhaps some leuco-

cytes, and, rarely, a few red blood-cells. Late in the disease or in the presence of a uræmic exacerbation or a complicating inflammation, the urine may be diminished in quantity, the albumin increased, and numerous casts be found in the more apparent sediment. Hæmaturia is a rare condition.

Epistaxis may form a serious symptom.

> Epistaxis in Bright's disease due to a sanguine dyscrasia, to alterations of the vessels supplying the nasal mucous membrane, to cardiac hypertrophy, and to increased arterial tension. Occurs most frequently in the interstitial form of Bright's disease, and is apt to appear principally at the beginning and at the end of the malady. Sometimes it is the first sign which excites a suspicion of the affection. Saverny (Thèse de Paris, '91).

> Case of cerebral hæmorrhages in advanced Bright's disease. Symptoms of the chronic interstitial form with marks of a slight, old, retinal hæmorrhage. One night the patient became quickly sleepless and delirious, and was found, the following morning, in a comatose condition. His temperature was slightly subnormal; there were no convulsions; the bladder was not distended; pulse, 80, small, compressible; pupils equal, a little dilated, reacting to light; no strabismus; no paralysis. Croton-oil was given, and hypodermics of pilocarpine; but the coma deepened, the breathing becoming stertorous, the chest filling with râles, and pulse and respirations failed almost synchronously. At post-mortem, to the left of the aqueduct of Sylvius, there was a small hæmorrhage, of the size of a pea, flattened from above downward in its site in the pontine part of the floor of the fourth ventricle. Walsh (Med. Press and Cir., Nov. 26, '90).

> Conditions in which hæmorrhage may occur in Bright's disease: high tension, modifications in the structure of the arteries, and hypertrophy of the heart. Potain (Jour. de Méd. et de Chir. Pratiques, Aug. 10, '94).

Literature of '96-'97-'98.

> Importance of hæmorrhage from the nose and into the ear as early manifestations of Bright's disease. Illustrative case. The so-called cases of spontaneous or idiopathic hæmorrhages into the ear ought all to be carefully investigated as to the possibility of an underlying nephritic cause. He would speak of a tympanitis or myringitis albuminurica, just as we speak of rhinitis albuminurica. Haug (Deutsche med. Woch., Nov. 5, '96).

Sudden œdema of the larynx may also supervene, and is always a grave condition. Transudations into the pleural sac (hydrothorax) and the lungs may precede the fatal termination. Dyspnœa is either uræmic or cardiac and is usually worse at night; a true orthopnœa, with Cheyne-Stokes breathing, may be observed in association with uræmic stupor and coma, and near the end of the patient's life.

The signs of hypertrophy of the heart (particularly of the left ventricle) may be elicited, though symptoms referable to the heart itself are absent, unless dilatation and feebleness, sudden arterial contraction, or endocarditis occur. Inspection and palpation show the apex-beat to be displaced downward and to the left, and the impulse to be increased, heaving, and rather circumscribed. In cases of co-existing emphysema, and later, when dilatation may eclipse the hypertrophy, these signs may become less evident. The left border of deep cardiac dullness extends outside the nipple-line in the fifth or sixth interspace. The first sound of the heart is loud and may be reduplicated. Accentuation of the aortic second sound is a distinctive sign, and indicates increased vascular tension; it may have a metallic quality in some cases. There may also develop a mitral systolic murmur as the

result of relative insufficiency. There is increased tension of the pulse, the latter being hard, persistent, and incompressible; the pulse-wave is also increased in duration (*pulsus tardus*). Most of the palpable arteries are hard, thickened, and tortuous, owing to the arteriosclerosis. As soon as compensation fails, symptoms of breathlessness on exertion, palpitation, and the like, appear; often these occur in paroxysms and constitute "cardiac asthma." The resulting stasis causes a transudation into the lungs (bronchorrhœa, pulmonary œdema) and later to œdema of the extremities.

> Of 106 fatal cases of chronic (interstitial) nephritis, 20 died from cerebral hæmorrhage; in all of these cases both kidneys were diseased, œdema of the extremities not being recorded in a single instance and œdema of the lungs in only 2, thus showing that all was going on well until the fatal rupture. The remaining cases died from œdema, principally involving the lungs and pleuræ. Œdema is, therefore, the most common cause of death; this occurs in consequence of the stretching of the auriculo-ventricular orifice, allowing of regurgitation. A mitral murmur is by no means always present. Arterial sclerosis is marked in the cases dying from cerebral hæmorrhage, and this might account for the non-dilatation of the auriculo-ventricular orifices. The heart-sounds assumed a clanging tone in several instances preceding the fatal result observed. Hawkins and Russell Dodd (Clinical Soc. of London; Annual, '94).

Since they are indicative, as a rule, of grave uræmia, the symptoms referable to the nervous system are of great importance. There may be neuralgic pains throughout the body, and insomnia, and cephalalgia is frequent. Later great drowsiness is often a premonition of uræmic coma. Muscular twitchings may precede convulsions, and should attract attention to the imminent danger. Cerebral apoplexy with hemiplegia may form the first symptom of contracted kidney, and is apt to occur in cases of marked hardening and weakening of the arteries. Hæmorrhagic pachymeningitis and hæmorrhage into the brain-substance may also occur. The hemiplegia may last until the end, or it may disappear soon and be followed by subsequent attacks at intervals. Dieulafoy believes numbness, formication, and pallor of the fingers ("dead finger") to be sometimes the earliest symptoms of chronic Bright's disease.

> The dead finger is a vascular trouble in cardiac disease, or an hysterical phenomenon, and has nothing to do with Bright's disease. The principal sign of renal insufficiency is the toxicity of the urine. The excretion of nitrogen in considerable quantity by the fæces is also a good sign. G. Sée (Bull. de l'Acad. de Méd. de Paris, June 27, '93).

Of the symptoms referable to the special senses nephritic retinitis often forms the earliest evidence of chronic Bright's disease. There may or may not have been present a slight dimness of vision prior to the ophthalmoscopical examination. There is a partial loss of vision in both eyes (amblyopia), and in grave cases sudden and complete blindness may come on (uræmic amaurosis) as the result of a neuroretinitis. The optic papilla is swelled, and surrounded by retinal hæmorrhages or by white dots and streaks ("feather-splashes").

Literature of '96-'97-'98.

> The varieties of albuminuric retinitis are (1) neuritis (optic papillitis, or interstitial neuritis with swelling and round-cell infiltration of the connective tissue of the nerve, leading, in some cases, to atrophy of the nerve-fibres).
>
> (2) Neuroretinitis, in which the retinal expansions of the optic nerve become swelled and ultimately granular and fatty. With these changes are associated white patches, of which there are two

kinds: (*a*) rounded, soft-edged areas of lymph-exudation and (*b*) smaller, bright, radiated streaks or specks. The latter are mostly seen radiating from the yellow spot. Their glistening appearance is due to the refractive power of the minute oil-globules of which they consist.

(3) Periarteritis; chiefly affecting the outer coats of the arteries, and causing them to become thickened, and to encroach on the lumen so as to obliterate the smaller ones. This condition is associated with hæmorrhages and capillary dilatations.

(4) Diffused opacity of the retina from œdema.

Diagnosis: None of the ophthalmic appearances described are pathognomonic of Bright's disease. Similar forms of neuritis and neuroretinitis are met with in cases of cerebral tumor, while hæmorrhages may occur in cases of leucocythæmia, chlorotic and pernicious anæmia, and purpura. Multiple retinal periarteritis, though generally associated with nephritis, is met with apart from this condition. The ophthalmoscopical appearance must always be confirmed by some of the more obvious signs of Bright's disease.

Causation: Four causes: (1) dyscrasia, or altered condition of the blood; (2) secondary degenerative changes in the small blood-vessels; (3) excessive pressure of blood within the vessels; (4) an inflammatory process of the affection of both vessels and nerves. Many regard the changes as purely degenerative.

Prognosis: The grave class of cases includes diffuse neuroretinitis, radiating patches around the yellow spot, and multiple periarteritis. These are most common in contracting granular kidney. When the changes are marked he would place the extreme duration of life at two years, whatever the state of the general health might be.

An exception to this rule is in the case of puerperal nephritis. Here the condition mainly depends on pre-existing dyscrasia of the blood, of which the retinal changes are only another local expression. Recovery is general, if pregnancy does not recur. The dyscrasia is not dependent solely upon renal disease.

The benign class of cases includes simple œdema, hæmorrhages, and soft-edged patches. All these conditions may subside, and their presence does not make the prognosis of the case better or worse.

One may conclude, therefore, that the prognosis is based upon the nature of the ophthalmoscopical changes discovered, and upon the nature of the nephritis which caused them.

In interstitial nephritis, retinitis is a measure of the general amount of vascular degeneration present. Advanced retinitis characteristic of interstitial nephritis, together with other signs of that disease, mean a speedy death.

On the other hand, signs of retinitis equally characteristic of other forms of nephritis are due to toxæmia rather than to vascular degeneration, and as such may be cured. Saundby ("Lectures on Renal and Urinary Diseases," '96; from review in Treatment, June 24, '97).

Tinnitus aurium, deafness, and vertigo are not uncommonly present.

Nausea, anorexia, and dyspepsia are frequent conditions. Severe vomiting may precede an attack of uræmia. Uræmic diarrhœa may occur, and there may also exist a catarrhal gastritis for some time, the tongue being thickly coated and the breath heavy and urinous.

Examination of the conditions of the stomach in twenty-six cases of chronic parenchymatous and interstitial nephritis, mostly in middle-aged patients, showing that renal disease has a marked influence upon the chemistry of gastric digestion. Kravkoff (London Med. Recorder, Jan. 20, '91).

Digestive troubles associated with diseases of the urinary apparatus often disguise the latter. Alapy (Revue de Thér. Médico-Chir., Oct. 15, '93).

Action of various constituents of the urine upon intestinal peristalsis. It is probable that, among the substances retained, there is some substance directly paralyzant to intestinal movement. It is not a very uncommon occurrence to have the uræmic diarrhœa followed by

a condition of intestinal paralysis, and cases of uræmia have unwittingly been operated upon for the relief of a supposed intestinal obstruction. Hirschler (Wiener med. Woch., Mar. 21, '91).

Case in which the existence of a typhlitis was, for a time, suspected; true nature of the case declared by a uræmic headache accompanied by blindness. Second case in which the cephalalgia was the most marked feature. These intestinal derangements characterize so large a class of uræmics, the disturbance being generally of the nature of diarrhœa, that practitioners should constantly suspect those seeking treatment for persistent alimentary troubles of being affected with an underlying nephritis. Taylor (Cincinnati Lancet-Clinic, Nov. 15, '90).

Twenty-two cases of ulceration of the intestine coincident with renal affections, and eight cases of hæmorrhagic extravasation without ulceration. Situated at all points of the intestine, but especially about the ileum, principal characteristic being that they were accompanied by hæmorrhage. Dickinson (Brit. Med. Jour., Jan. 13, '94).

Complications in the digestive tract. Examination of 17 cases,—3 of large waxy kidneys and 10 of secondary and 4 of primary contracted kidney,—intestinal lesions in most of them, from simple catarrh to diphtheritic exudation. Fischer (Deutsche med.-Zeit., Aug. 9, '94).

Warning against the administration of an opiate in any diarrhœal patient above 50 years of age, owing to the untoward effect of opium in cases of renal insufficiency. Musser (Times and Register, Oct. 17, '91).

There is, as a rule, no œdema in renal sclerosis, and when it does occur (as in the ankles and limbs) it is due to cardiac dilatation and failure. The skin is dry, and the pores sometimes appear lustrous with minute scales of urea. The skin has often, also, a cyanotic tinge, with a certain degree of pallor. Troublesome eczema and pruritus are often present, and muscular cramps may make the patient still more uncomfortable; the latter occur at night and especially in the calves of the legs. Other cutaneous disorders may also occur.

1. There is a bright-red diffused rash which appears chiefly on the trunk, less extensive on the neck, arms, and thighs, and very seldom on the face, hands, or feet. It is distinguished from the somewhat similar rash produced by natural or artificial diaphoresis by its locality, by the absence of sudamina, and by its appearing when no hot-air baths or other means have been used to produce sweating and when the skin is harsh and dry. It does not, as a rule, either itch or smart, and only remains a few days. Most often seen in cases of chronic tubal nephritis.

2. There is a papular eruption with large, discrete, rather dark-red pimples seated on a dry, rough, and sometimes scaly surface. This more often seen on the outer side of the thighs and legs, the shoulders, and extensor surface of the forearms, but it also may affect the loins and the abdomen. Personally never seen on the face or on the hands and feet.

3. Apart from the mere coincidence of eczema with Bright's disease, there may be observed in some cases a moist dermatitis resembling eczema in its aspect, but accompanying the arms or the legs, without affecting the flexures of the joints, the face or the ears, without the irritation commonly present, and without having previously appeared.

4. On two occasions a very extensive and profuse dermatitis seen, closely resembling the universal exfoliative dermatitis of Wilson, very red, very scaly, occupying the scalp, palms, soles, and genitals, as well as the trunk, face, and limbs. It has come on after the symptoms of Bright's disease have appeared, in cases of chronic interstitial nephritis, with little dropsy, and cardiovascular changes already apparent. P. H. Pye-Smith (Brit. Med. Jour., Nov. 30, '95).

Debility and emaciation become extreme, with the gradual failure of the general nutrition.

Uræmia may supervene at any time, and may even form the first symptom;

it may also be sudden and severe in its attack (acute uræmia), or gradual, mild, and insidious (chronic). These uræmic attacks may be accompanied by either a normal temperature, or by moderate fever; the temperature may even be subnormal, in chronic uræmia with prostration, coma, a feeble pulse, and delirium.

Among the complications that may occur in the red, granular, and contracted kidney are the following: Pleuritis, endocarditis, pericarditis; pneumonia, either lobar or lobular; laryngitis, bronchitis, hepatic cirrhosis, gastritis, enteritis, peritonitis, meningitis, emphysema, phthisis, and mental disorders.

Early in the establishment of chronic Bright's disease, especially the interstitial variety, the mind seems somewhat fogged or "muddy," the soundness of business judgment is apt to be impaired; there are irritability, petulance, and depression often noted; the patient may become a little self-distrustful, suspicious, or somewhat secretive about his affairs or intentions; he is easily annoyed by loud noises, is disinclined to exercise his intellect, apt to doze in the day and be wakeful at night, and in many ways indicates the approach to the borders of insanity. Andrew Clark (Brit. Med. Jour., Feb. 4, '83).

Affections of the kidneys are very common among the insane. Uræmic poisoning is one of the most frequent causes of insanity. Alice Bennett (Alienist and Neurol., Oct., '94).

[We doubt very much whether Dr. Bennett finds many followers in her confession of faith. We venture the prediction that, of 1000 cases in ordinary life, as many cases of kidney disease will be found as in the same number of the insane, if general paretics are excluded. We have made it a subject of careful observation for some years, and have not found the proportion of kidney lesions which Dr. Bennett appears to have observed. In the few cases of "grave delirium" which have come under our care this point has been especially examined with negative results, and the same may be said in the majority of instances of mental depression and anxiety. Brush, Assoc. Ed., Dept. of Mental Dis., Annual, '91.]

Important to distinguish those cases where the insanity exists along with, but independently of, the renal condition, not being influenced either in its inception or in its manifestations by the nephritis, and those cases which are called into being by the toxication from the renal inadequacy, or those which, existing perhaps latently as an hereditary predisposition, are intensified by the influence of the disease of the kidneys so as to become manifest. The latter classes of cases may be examined as to their mental condition, with a view of estimating as well the degree of failure of the renal function; while they are more yielding, the treatment of the underlying nephritis modifies the symptomatic mental condition. Joffroy (Le Bull. Méd., Feb. 4, '91).

Case in which alternation of coma with maniacal outbursts and with occasional delirium marked clearly the relationship between the ordinary manifestations of uræmia and conditions of alienism. The patient eventually recovered from all active symptoms. Remondino (Jour. of Nerv. and Mental Dis., Oct., '91).

Case of a patient who suffered from insanity and chronic nephritis. Whenever the renal disease was exacerbated, the patient's mental condition also became worse.

Case of a lady, in whom the autopsy showed interstitial nephritis, who passed the last weeks of her life in a state of acute delusional insanity. Raymond (Gaz. Méd. de Paris, Nos. 25 and 26, '90).

Similar case, except that the patient became cataleptic and manifested bulbar phenomena a short while before death. Brissaud and Lorring (Gaz. des Hôp., Nos. 31 and 32, '90).

Sometimes it would seem that the uræmic poison alone suffices to engender psychical disturbances. Most frequently however, the delirium of insanity occurs because, either from an insane predisposition or from a general neurotic predis-

position, the brain is found a point of diminished resistive power. Careful examination into the personal and family history for one or the other of these predispositions is a matter of greatest importance in the matter of diagnosis, of prognosis, and of treatment. Florant (Thèse de Paris, '91).

Number of cases and statistics showing the frequency of nephritis in insanity. Bondurant (Jour. of Nerv. and Mental Dis., Nov., '92).

Mental aberration—illusions, hallucinations, general confusion, impairment of memory, aphasia, neuralgia, paralysis, etc.—connected with renal lesions. Bremer (Med. News, Oct. 20, '94).

Etiology.—Sometimes the cause of the slow, primary, diffuse degeneration, atrophy, and fibroid contraction of the kidneys is quite obscure, and in certain cases it would seem to be "only an anticipation of the gradual changes which take place in the organ in extreme old age" (Osler),—the "senile kidney." Heredity undoubtedly plays a part in the causation of certain cases, and its influence has extended down through the third and fourth generations.

Age and sex also exert an influence, the disease being more common in males than in females, and usually beginning near middle life. It is rarely manifested symptomatically until the fiftieth or sixtieth year. A special tendency to sclerotic degeneration of the arteries, from whatever injurious influence, whether chemicotoxic or parasitic, renders the patient more prone to interstitial nephritis, though prolonged irritation by such agents may also cause the disease in persons whose cellular nutrition is usually not defective. Alcoholism, uric acid, and lead, giving rise to chronic poisoning, have all been assigned as causes of the disease.

Interesting example of chronic nephritis produced by action of lead. The case succumbed and autopsy justified the primary diagnosis of a chronic interstitial nephritis.. Jaccoud (La Sem. Méd., Dec. 17, '90).

Frequency of granular nephritis in file-cutters, who, it is known, are exposed to lead poisoning. Hall (Clinical Jour., Nov. 29, '93).

Mixed parenchymatous, degenerative, and proliferating interstitial nephritis in a man who suffered from saturnine colic and whose brain contained lead. W. Ebstein (Schmidt's Jahrbucher, Apr., '94).

Chronic malaria and syphilis also probably exert a causative influence.

Habitual overeating and overdrinking no doubt frequently cause granular atrophy and sclerosis of the organ, owing to the imperfect assimilation of the substances ingested and the constant excretion of irritating products by the kidney caused thereby. A wide-spread cause of the disease is the continuous and even moderate use of alcohol for many years; especially is this true in the case of spirituous liquors. It is just as probable that the excessive use of red meats in the diet leads to the production of the uric acid that induces the renal condition (uricæmia-lithæmia) by deranging the hepatic function (Murchison).

Gout may also cause chronic Bright's disease, and is allied to the above; this occurs perhaps more frequently in England than in this country, where lithæmia and nervous dyspepsia are more often seen.

Strümpell states that severe articular rheumatism is sometimes followed by contracted kidney.

Chronic nephritis when met with in chlorotics depends upon an arterial lesion; patients affected with the two diseases are clearly descendants of gouty arteriosclerotic ancestors. Lancereaux (Bull. de l'Acad. de Méd. de Paris, p. 727, '93).

Case of chronic parenchymatous nephritis giving rise to symptoms mistaken

for those of chlorosis, and illustrating hæmic and circulatory disturbances arising from the action of retained toxic principles. Hollopeter (Med. and Surg. Reporter, Jan. 10, '91).

Bright's disease in two children in the course of rheumatic purpura. Both cases characterized by articular pains, hæmorrhages beneath the skin, and from the mucous membrane of the alimentary canal, pains in the back, œdema, occasional hæmaturia, continuous albuminuria, and in one the presence of casts, hyaline and epithelial. One child died from asthenia. Relationship between this renal condition and acute rheumatism cannot be affirmed, inasmuch as it is by no means established that the purpura rheumatica is of rheumatic origin. Moussous (Revue Mens. des de l'Enfance, Feb., '91).

Appearance of great quantities of uric acid in the blood of nephritis not as constant as observations of Jacobi might lead one to think. Fodor (Centralb. für klin. Med., Sept. 7, '95).

Two instances of chronic diffuse nephritis: one, in a man 33 years of age, arising apparently from the results of an attack of rheumatism, unassociated with cardiac trouble, but accompanied by hepatic cirrhosis. The other, a woman aged 43 years, in which there was an indefinite history of rheumatism, but in which the graver stages of the disease were induced by an attack of influenza. There was, in this case, mitral valvular regurgitant and obstructive lesions, as well as the evidences of tricuspid insufficiency. The renal and cardiac lesions probably arose independently of each other, although having decided mutual influence in the latter stages of each. Anders (Med. and Surg. Reporter, July 11, '91).

Most renal affections, especially those connected with neuralgic or inflammatory disturbances of the secretory apparatus, are often accompanied by vesical symptoms, more or less intense, without the bladder appearing affected. Occasionally arthritic symptoms, closely simulating those of acute arthritic rheumatism, occur as part of the uræmic complex. Brodie (Gaz. Heb. des Sci. Méd. de Bordeaux, Feb. 15, '91).

Anxieties, worries, and the high nervous tension required by modern business activity and by social life (the latter, particularly, in elderly ladies) favor the development of chronic Bright's disease. Associated with these causes are usually to be found an overindulgence in rich foods and sedentary habits.

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Case in which acute nephritis occurred as a complication of chronic gastroenteritis in a woman aged 27. No history of illnesses or family predisposition. She had had diarrhœa for nine months, pain in the gastric region, and anorexia for six months. The nephritis appeared suddenly and proved fatal in a few days from eclampsia, coma, and collapse. The kidneys presented all the appearances of an acute nephritis. The other organs were healthy. Ebstein (Deutsche med. Woch., June 10, '97).

The cold, moist, climate of New England and the Middle States seems, to Purdy, to predispose to contracted kidney. Hydronephrosis, chronic pyelitis, and chronic congestion of the kidney (of cardiac origin, etc.) may cause a chronic productive nephritis without exudation, though never the true "contracted and red-granular" kidney.

Bright's disease is the result of a single pathological process subject to modalities of microbian origin, involving the connective-tissue stroma and the secretory substance, independently or separately, with fibroid, contracted kidney as ultimate phase. It occurs as secondary manifestation of many infectious diseases. Editorial (Boston Med. and Surg. Jour., Jan. 10, '95).

Cases seemingly showing that parenchymatous nephritis may result from a retention of urine and infection of blood by bacteria in themselves capable of causing nephritis. Favre (Virchow's Archiv, Jan. 4, '95).

Microbes, by means of their toxins, are able to produce kidney disease without being present *per se* in the organ. Holst (Medicinsk Revue, Feb., '95).

Pathology.—The reduction in size and weight is about equal in both organs in genuine primary contraction of the kidneys. The two kidneys may together weigh not over two ounces, and they may be only one-half or one-third the normal size. They are frequently imbedded in thick, adipose tissue, and the capsule is thick, opaque, and very adherent; so that, on stripping it off, portions of the renal cortex come away at the same time. The outer surface of the organ is red, irregularly granular, or finely nodular, and occasionally small cysts are present. The tissue is firm, dense, and resistant to the knife. The cut surface shows a thin, atrophied cortex, with dark-reddish streaks alternating with pale portions. The pyramids are darker than the cortex, and are also diminished. In the gouty contracted kidney they show fine striations of sodium urate or of uric acid, or crystals representing uric-acid infarctions. The principal changes are seen microscopically to be an increased production of connective tissue, especially in the cortical substance, and a more or less proportionate degeneration and atrophy of the renal parenchyma. The destruction of the latter is due to the circulation of noxious agents, but it is replaced by cicatricial fibrous tissue (Weigert). This new tissue is not uniformly distributed in the cortex, but appears in irregular masses around the shrunken glomeruli or between the tubules. In the pyramids the distribution is more general. The glomeruli are, in many instances, very small and fibrous in advanced cases; in the earlier cases the cells of the tufts and capsules are swelled and multiplied and a small-celled infiltration may be seen around the glomeruli and tubules. This cellular infiltration later becomes fibrillated and ends in thickening. The changes in and the growth of the capillary and intracapillary cells and of those around the tufts are partly responsible for the glomerular atrophy, as are also the capsular thickening and hyaline or waxy degeneration and the thickening and occlusion of arterioles. The tubules show decided changes, some being included in masses of connective tissue, with resulting compression-atrophy and even obliteration of the lumen. Others show constriction by the intertubular connective tissue, the lumen elsewhere thus being increased; this is especially prominent in the granules on the outer surface of the kidney, and little cysts may be seen here and there by the naked eye, as the result of damming back the urine in the tubules thus affected. The epithelium lining these tubules shows granular, fatty, or waxy degeneration, and may be either flattened, cuboid, or swollen in variety. The tubes may contain fatty or granular *débris* and tube-casts.

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In a former paper it was concluded that an actual physical alteration of the tissues is brought about by the toxic substances retained in the blood owing to the insufficient action of the kidneys. This alteration leads to œdema, on the one hand, and to a rise of arterial pressure, on the other, due to increased peripheral resistance. From this follows the hypertrophy of the heart.

This theoretical view now confirmed by actual experiment. Physiological sodium-chloride solution was injected hypodermically in cases of nephritis without œdema, and it was found that the artificial œdema thus produced was not absorbed for from five to ten days, while if the same were done in non-nephritic cases, even when heart disease was pres-

ent, it disappeared in a few hours, or in three days at the latest. This proves that the absorptive power of the subcutaneous tissue is much restricted in Bright's disease. Reichel (Centralb. f. inn. Med., Oct. 15, '98).

The growth of fibrous tissue in the walls of the arteries, causing sclerosis, forms an important change in most instances. The intima (endarteritis), media, and adventitia are all thickened by the hyperplasia of connective-tissue elements, and the arteries and capillaries are, in this way, mostly occluded by the obliterating endarteritis or by their conversion into connective tissue. Waxy or hyaline degeneration is also seen. These changes may sometimes form the primary condition that leads to granular and contracted kidneys, and may represent the renal effects of a general arteriosclerosis.

In a case of interstitial nephritis terminating in cerebral atrophy, aneurismal dilatations of the cerebral arteries observed, besides an hæmorrhagic area filled with fluid blood, which might have been taken for an aneurism, which was in reality due to rupture of the artery and successive hæmorrhages into the cerebral substances. Israel (Berliner klin. Woch., Jan. 29, '94).

The urea introduced into the circulation leads to a constriction of the vessels of the periphery. Retention of urea causes elevation of vascular pressure and is the cause of cardiac hypertrophy in patients with Bright's disease. Chiaruttini (Inter. klin. Rund., Feb. 18, '94).

Cardiac hypertrophy is an almost constant attendant upon chronic, non-exudative, productive nephritis, and its degree depends upon the extent of the renal, and also of the general arterial, degeneration and sclerosis. *Cor bovinum* has been applied to the organ, on account of its extreme size in this affection. The left ventricle only is hypertrophied in moderate enlargements.

Among the many complications of chronic Bright's disease may be mentioned cirrhosis of the liver, pulmonary emphysema, cerebral hæmorrhage, chronic endocarditis, endarteritis, pericarditis, and bronchitis.

Prognosis.—Chronic interstitial nephritis varies in duration, and in uncomplicated cases it may last for five, ten, twenty, or possibly thirty years. The duration may, however, be very much shortened by complications or intercurrent affections, or the condition may not be appreciated, as often occurs, when the post-mortem examination discovers the characteristic kidneys in one who had no symptoms of renal disease during life and whose death was directly due to some intercurrent affection. Life is destroyed sooner or later by this disease, unless the patient first dies from some intercurrent malady. Irreparable damage to the organs results from the gradual destruction of the renal parenchyma and its replacement by scar-tissue. The fact, however, that the process is slow and its duration, therefore, long allows a preservation of life for many years, and often with comparative comfort. The prognosis depends much upon the general condition of the patient, the cardiovascular system, and upon the presence of uræmia and inflammatory complications. A not far distant end is indicated by cardiac dilatation and insufficiency. Hæmorrhages, diarrhœa, persistent vomiting, nephritic retinitis, coma, and delirium render the prognosis exceedingly grave. Convulsive and apoplectic seizures are often fatal.

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Hæmaturia, a frequent accompaniment of nephritis, is of grave import. Case of Bright's disease kept in comparatively good health by strict attention to diet and climate several years. As soon as

hæmaturia appeared, however, he rapidly lost ground and died. Any appearance of blood, however slight, in chronic nephritis denotes an early demise. Dieulafoy (Jour. de Méd., May 10, '97).

Treatment. — A strict hygienic *régime* following an early appreciation of the disease will, to a considerable degree, prevent the advance of the cirrhotic process. Noxious substances that have an etiological influence must be removed as thoroughly as possible and avoided. Uric-acid formation must be reduced by dietetic supervision, alcohol must be interdicted, and lead—when the causative factor—must be prevented from further poisoning the system by a change of occupation. The heart and blood-vessels are also preserved by the diminution of these irritants. The hygienic treatment embraces a regulation of all the habits of the body and the mode of living. The malady is incurable; therefore the patient himself must be treated, and not the malady. A suitable dietary must be formulated for each individual, and Saundby's rule furnishes a good working principle: "Eat very sparingly of butchers' meat; avoid malt liquors, spirits, and strong wines." An absolute milk diet may be necessary for short periods in the presence of gastric irritability, but undue weakness will be the result of a continued restriction to milk alone.

Protests against the uniform and unreasoning use of milk diet in every case of albuminuria; it is insufficient for an adult, since 4 quarts of milk furnish but 6 1/2 ounces of carbohydrates, while the quantity necessary for an adult in a state of absolute repose is 10 1/2 ounces. Only weak and lymphatic subjects can support a diet of 4 quarts of milk daily. A mixed milk diet with vegetables, boiled or roast fish, broiled meats, and game in chronic interstitial nephritis. Indications for a pure milk diet are acute nephritis and acute attacks in chronic nephritis. Vergely (Jour. de Méd. de Bordeaux, No. 42 *et seq.*, '93).

Most writers have pointed out that the cases in which benefit is to be obtained by the exclusive use of milk, or the so-called "milk diet," belong almost exclusively to the recent and acute forms. C. H. Ralfe (London Lancet, May 30, '93).

Milk is used to excess in Bright's disease and leads to anæmia. Several cases in which a resumption of ordinary diet has brought about a marked improvement. The exclusive milk diet to be reserved for cases of acute nephritis, from whatever cause arising, and for the accidents, such as hæmaturia, uræmia, etc. Even here an average of from a week to a fortnight's milk diet gives all the good one can reasonably expect. Lecorche and Talamon (La Méd. Mod., Jan. 14, '93).

Protest against the indiscriminate use of milk in cases of chronic Bright's disease. R. Quain (Brit. Med. Jour., Apr. 29, '93).

Authors are by no means unanimous as to the best diet for patients with chronic Bright's disease. All the *a priori* reasons urged in favor of milk or any other particular diet were fallacious. The only way to attack the problem is carefully to observe the condition of the urine and the condition of the patient upon different diets.

1. Quantity of urine. Usually more urine was secreted upon farinaceous or milk diets than upon full diet.

2. Specific gravity. The diet had no certain influence on this, but, on the whole, it was lower on milk and farinaceous diets than on full diet.

3. The quantity of albumin passed. The figures showed that nearly always the albumin passed was more upon milk diet than upon farinaceous, and less upon full diet than upon either milk or farinaceous. Patients always best avoided loss of albumin by a full diet.

4. The quantity of urea passed. The influence of diet upon this was most uncertain; often less urea was passed upon full diet than upon farinaceous, and less

upon farinaceous than upon milk. Sometimes the reverse was true.

5. General condition of the patient. The cases distinctly showed that a full diet was not more liable to lead to uræmia than any other; in fact, in one patient full diet appeared to ward off uræmia, and the patient ultimately recovered. The patients always felt and seemed much better and stronger on full diet, or on farinaceous diet with meat or eggs added, than on milk or farinaceous only. Hale White (Brit. Med. Jour., Apr. 29, '93).

After experience in many cases treated on a full, mixed, or ordinary diet, several of which had previously been long kept on a diet as slightly nitrogenous as possible, no occasion to regret the employment of this method. In general, amendment, with rapidly-receding anæmia was so striking and immediate as to lead to the conclusion that they had been suffering more from the treatment than from the disease. Donkin (London Lancet, May 13, '93).

Case of chronic Bright's disease in which the classical treatment was badly borne, and in which the best results were obtained from a diet consisting of finely-minced beef, butter, black-bread, tea, and coffee. Walling (Med. and Surg. Reporter, Nov., '93).

Loss of albumin main point to be counteracted. Loss not made up by increase of proteid food. Rich proteid diet may lead to retention of nitrogenous extractives. Hence, 6 ounces of meat, 13 ounces of bread, liberal allowance of vegetables and fruit, $1\frac{1}{2}$ ounces sugar, 5 ounces fat a typical diet in chronic albuminuria. Milk mainly useful in acute cases when loss of appetite, or in addition to above mixed diet. Hirschfeld (Zeit. für Krankenpflege, May, '95).

A light, nourishing diet is, therefore, advisable. Lean meat may be allowed once daily in favorable cases, and vegetables, greens, fruits, and light, well-cooked, farinaceous articles may also be partaken of. Tea, coffee, and cocoa may be drunk. The use of the natural mineral waters aids in the renal circulation and keeps the kidneys flushed. As a rule, a mixed diet will be advantageous. The carbohydrate and nitrogenous elements (sugars and starches) should be used in moderate amounts, but fruits and pure fats are to be strongly recommended.

[On the treatment of albuminuria in its permanent form there is a remarkable unanimity of opinion on the subject of dietary. All seem now to be agreed that, in every case of albuminuria, a pure animal dietary of flesh should, as far as possible, be avoided, and should be replaced by a vegetable and fecaline diet. Thus, so distinguished an observer as Dujardin-Beaumetz argues that, under the influence of an exclusive animal diet, the quantity of albumin eliminated in twenty-four hours is nearly doubled, while, under an exclusively vegetable and fecaline diet, the albumin is reduced to a third part of the quantity that is eliminated under a *régime* of mixed animal and vegetable food. This idea of a purely vegetable diet in albuminuria has, in many cases, been accepted as superior to the milk diet, with which we have been for some years past acquainted, and which has answered sometimes remarkably well. As it seems to me, the evidence altogether favors the idea that the purely vegetable *régime* is the best, or, at all events, a *régime* in which the vegetable food plays the chief part and in which milk comes in simply as an accessory. This would accord with my own experience of diet in albuminuria. Benjamin Ward Richardson, Assoc. Ed., Annual, '93.]

Persons that take considerable exercise may have considerably more food than those who are stout or who lead sedentary lives. Gastric disorders require a liquid diet until the digestion is restored, or the elimination of all but the soft and bland foods. All extremes of activity (bodily, mental, and emotional) are to be avoided.

Excess of mental work an etiological factor. Phosphates, which are elimi-

nated in large quantities after cerebral activity, play the part of irritant substances upon the kidneys, thus producing chronic inflammation. Wm. A. Thom, Jr. (Va. Med. Monthly, May, '94).

After violent muscular effort, there is an increase in the quantity of leucocytes and epithelial cells normally found in urinary sediment, and likewise the apparition of cylinder-casts. Penzolt (Münchener med. Woch., Oct. 17, '93).

Cases in which necrosis of renal tubules seemed due to repeated convulsive attacks,—*i.e.*, muscular fatigue. Delirium and restlessness possible causes, thus explaining beneficial effects of narcotics and sedatives. Reichs (Centralb. für klin. Med., No. 2, '95).

Examination of the kidneys of a dog suffering from chronic nephritis brought on by exclusively nitrogenous food and absence of exercise. Similar conditions produce nephritis in man. Adami (Montreal Med. Jour., July, '94).

Physical exercise should be moderate and regular, and, if the climate be warm and dry, it should be taken in the open air. The patient should never be subjected to the vicissitudes of worry, anxiety, or to the tension of competition. Indulgences of whatever nature, if they tend to unbalance self-control or disturb the equanimity of the patient, must be strictly prohibited.

Often life may be prolonged by a change of residence to a warm, dry, and mild climate, since the variability and humidity of temperate climates, particularly during the winter season, tend to aggravate the disease. A sea-voyage or a sojourn at some southern Europen resort may be very beneficial.

Medicinal treatment is employed for the following indications: The bowels should be kept free by the assistance of laxatives or by laxative alkaline mineral waters. Papoid, peptenzyme, and other digestants, with bitter tonics are useful in cases of furred tongue and indigestion. Acids or alkalies, according to their special indications, may also be used simultaneously.

High vascular tension is to be met by the cautious use of nitroglycerin in gradually increasing doses, beginning with 1 minim three or four times daily, until all danger of rupture of the vessels is over.

Nitroglycerin for a considerable length of time, so proportioning the dose that the intervals shall be comparatively short,—never less than four times daily, and the amount never more than that just necessary to cause the slightest feeling of fullness in the head or to slightly quicken the pulse. In this way a remarkable tolerance of the drug is obtained. Stewart (Ther. Gaz., Sept. 15, '93).

The other extreme, of a very low tension that induces dropsy, and complications, usually uræmic (convulsions, dyspnœa, and headache) also call for therapeutic assistance. Headache, vertigo, and the so-called renal asthma (dyspnœa) are also often relieved by nitroglycerin.

Case of renal asthma in which venesection arrested imminent death. There was 0.015 per cent. of uric acid found,—a distinct excess. R. Kirk (Brit. Med. Jour., June 9, '94).

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Morphine hypodermically employed is of conspicuous benefit in the shortness of breath of uræmia. Uræmic asthma yields promptly to hypodermic injections of morphine. On the other hand, persistent distress of breathing may be due to dropsy, and such a condition is not improved by the use of morphine. The headache and sleeplessness occurring in uræmic patients can generally be removed by the hypodermic injection of morphine. Sydney Ringer (Jour. of Amer. Med. Assoc., Oct. 8, '98).

Low tension, with scanty albuminous urine, œdema, and signs of dilatation, requires heart-tonics and stimulants, in

conjunction with purgatives. Digitalis is effective, and especially in infusion, combined with strychnine nitrate or with caffeine citrate. The dropsy calls for calomel and the salines.

Ingestion of from 2 to 6 thyroid glands of the sheep per week; the density of the urine and the quantity of urea increase very sensibly. Gifford (London Lancet, Mar. 31, '94).

Extract of fresh sheep- or pig- kidney possesses undoubted diuretic action and reparative power. Schiperovitsch (La Méd. Mod., Apr. 17, '95).

Literature of '96-'97-'98.

So long as it has not been better established by experiment that extracts of the kidney can supply or re-establish renal function, it would be prudent, before all, to consider the kidney as an excretory organ without taking account of its internal secretion and to abstain from injections of nephrin, recently tried, as well as from vesicatory applications that are known to irritate renal epithelium. Layral (Bull. Méd., Oct. 9, '98).

Uræmic symptoms are to be managed, as in acute Bright's disease, by means of free catharsis and profuse sweating, and occasionally by phlebotomy. In convulsions, severe headache, or dyspnœa, inhalations of amyl-nitrite or chloroform, or the hypodermic injection of morphine. $^1/_6$ grain, may be tried. When there is a probable malarial or syphilitic origin, contracted kidney may be benefited by the use of arsenic and the iodides, respectively. No medicaments, however, can ever transform the connective-tissue cells into secreting kidney-cells or restore the destroyed renal parenchyma.

James M. Anders,
Philadelphia.

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